

PLAN  
Scale: None

END VIEW  
Scale: None

BOLT $\phi$	B	T	D
1 1/4"	5 1/2"	3/4"	1 5/16"
1 1/8"	5"	11/16"	1 3/16"
1"	4 1/2"	5/8"	1 1/16"
7/8"	4"	9/16"	1 5/16"
3/4"	3 1/2"	1/2"	1 3/16"
5/8"	3"	3/8"	1 1/16"
1/2"	2 1/4"	5/16"	9/16"

Note:  
All plate washers to be  
galvanized.

APPROVAL	
<i>E. S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 6/20/75	
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SHA	FHWA
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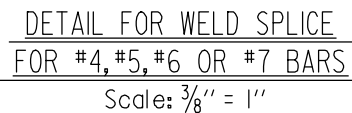
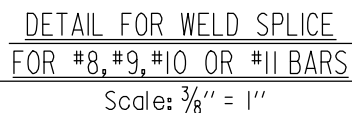
FHWA APPROVAL  
DATE: 11-9-76

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
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## STEEL PLATE WASHER DETAILS

STANDARD NO. M(0.01)-75-8

SHEET 1 OF 1



Notes:

3. All welding to be in conformance with ANSI/AWS-latest addition.
4. Prequalification required in conformance with ANSI/AWS-latest addition.
5. Angles shall be made of ASTM A 709 Grade 36 or AISI 1010, 1015 or 1020 steel.
6. E7018 electrodes shall be used in making the above welded splices.
7. If sufficient bar lap is not available when existing reinforcing steel is exposed, this detail to extend bars shall be used. Cost of these connections shall be included in contract prices bid on pertinent concrete items.
8. Welded splices shall not be used in decks.

E = Effective throat weld

$$E = .4S$$

$S$  = Radius rebar

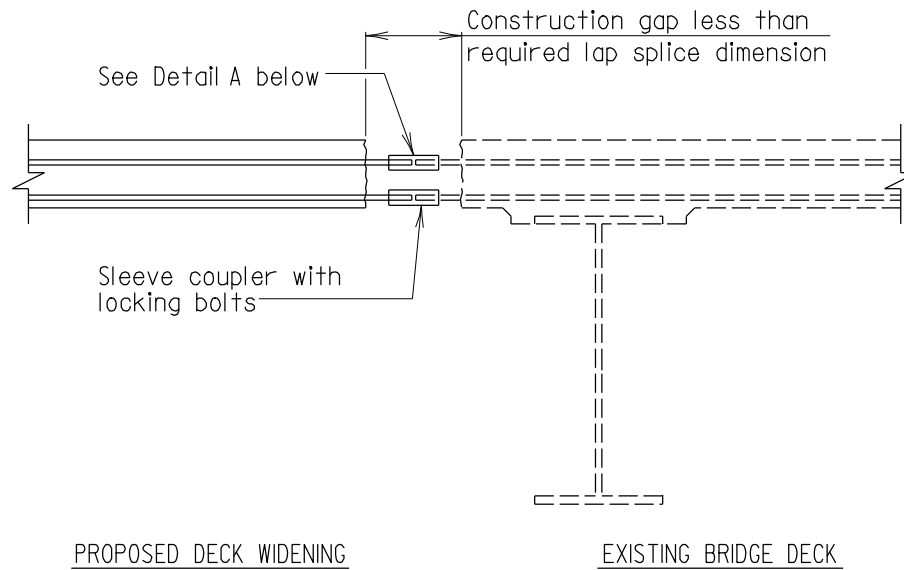
APPROVAL	
<u>E.S. Friedman</u> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/18/76	
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9-24-96	.
8-7-98	.
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11-26-07	.

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SPLICING TO EXISTING REINFORCING STEEL  
WELDED SPLICE

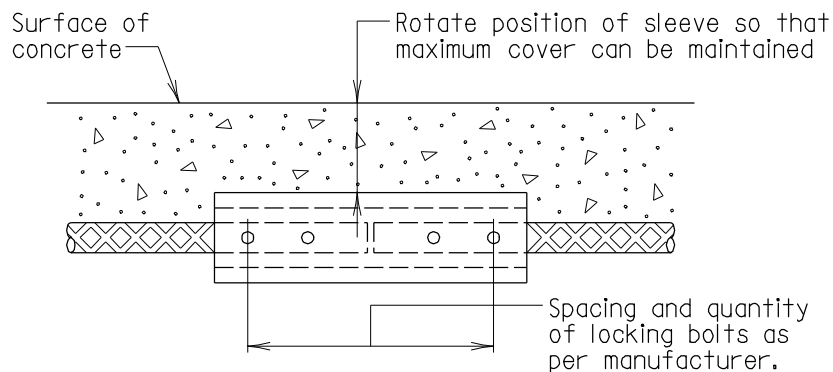
STANDARD NO. M(6.01)-75-12

SHEET 1 OF 2



### SECTION THROUGH SLAB

Scale: 1" = 1'-0"



### DETAIL A

Scale: 3" = 1'-0"

#### Notes:

1. The coupler must develop a minimum of 125% of the specified yield strength of the reinforcing bar being spliced.
2. Couplers used to connect epoxy coated reinforcing bars must be epoxy coated.
3. The uncoated surface of the sheared off indicator bolt must be covered with epoxy prepared from an approved epoxy touchup kit.
4. Longitudinal deck reinforcing steel is not shown.
5. Existing slab shown dashed.
6. These couplers will not be measured for payment, but all costs thereof shall be included in the Contract lump sum price for the pertinent Reinforcing Steel items.

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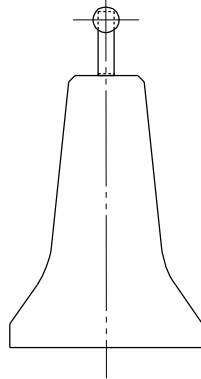
SPlicing TO EXISTING REINFORCING STEEL  
MECHANICAL SPLICE

STANDARD NO. M(6.01)-75-12

SHEET 2 OF 2

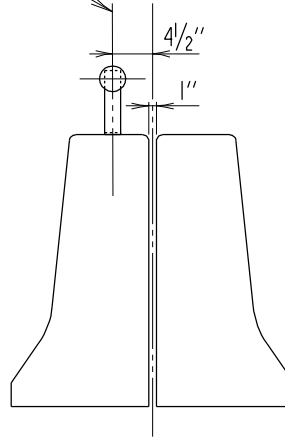
MISCELLANEOUS

Ø Yellow Delineator and  
Ø Barrier



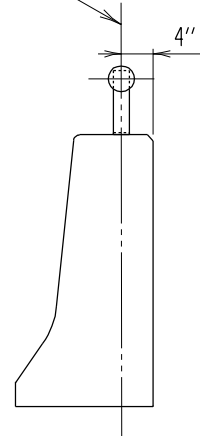
SOLID MEDIAN BARRIER

Ø Yellow Delineator



SPLIT MEDIAN BARRIER

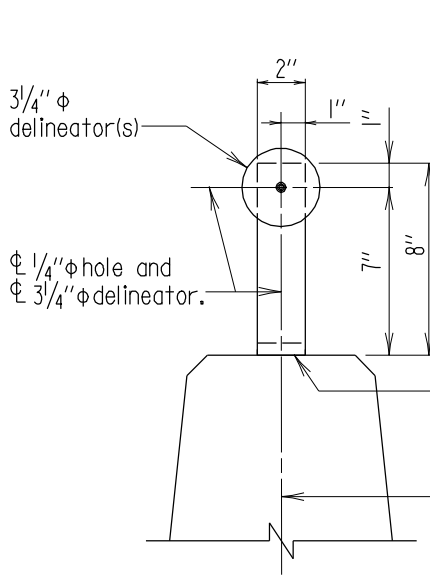
Ø White Delineator



SINGLE FACE BARRIER

### TRANSVERSE LOCATION OF DELINEATORS

Scale: 1/2" = 1'-0"



END VIEW

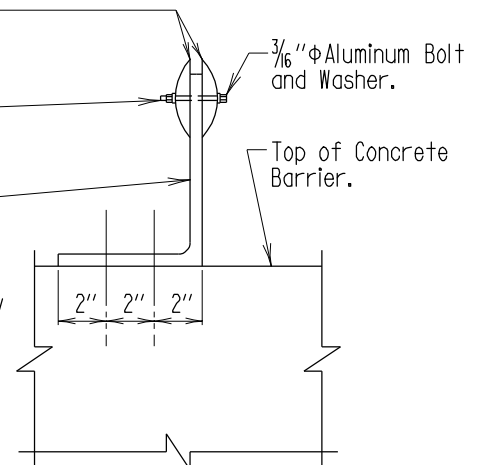
2 - 3/4" Single delineators  
(Median Barrier Only).  
3/4" Single delineators  
(All other Barriers).

Aluminum Nut and Washer  
(Burr threads after tightening).

Delineator support to be  
8" x 6" x 1/4" L or bent  
plate (Aluminum).

Bottom of 6" leg of angle to be thoroughly  
coated with an approved caulking compound  
or an approved zinc chromate paint.

Ø 2 - 1/4" Ø Galvanized Bolts in Bulldog  
Gold Digger Flush Drill Anchors (or  
Approved Equal). As alternate, the  
Contractor may cast 2 - 1/4" Ø x 4" long  
galvanized bolts in the concrete. Use  
galvanized nuts and washers to fasten  
support to barrier.



SIDE VIEW

### CONCRETE BARRIER DELINEATOR

Scale: 1/2" = 1'-0"

#### \* SPACING OF DELINEATORS

Radius of Horizontal Curve	C/C Distance Between Delineators
Less than 2000'	115'
2000' to 3000'	130'
3000' to 5000'	160'
Over 5000'	200'
Tangent Area	200'

\* Place one delineator at each end of each  
wall, even if wall is shorter than lengths  
indicated below.

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DATE: 8-24-76

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DATE: 6/20/75	
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10-19-77	10-19-77
6-10-80	7-29-80
10-22-03	

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
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CONCRETE BARRIER DELINEATOR

STANDARD NO. M(5.11)-75-14

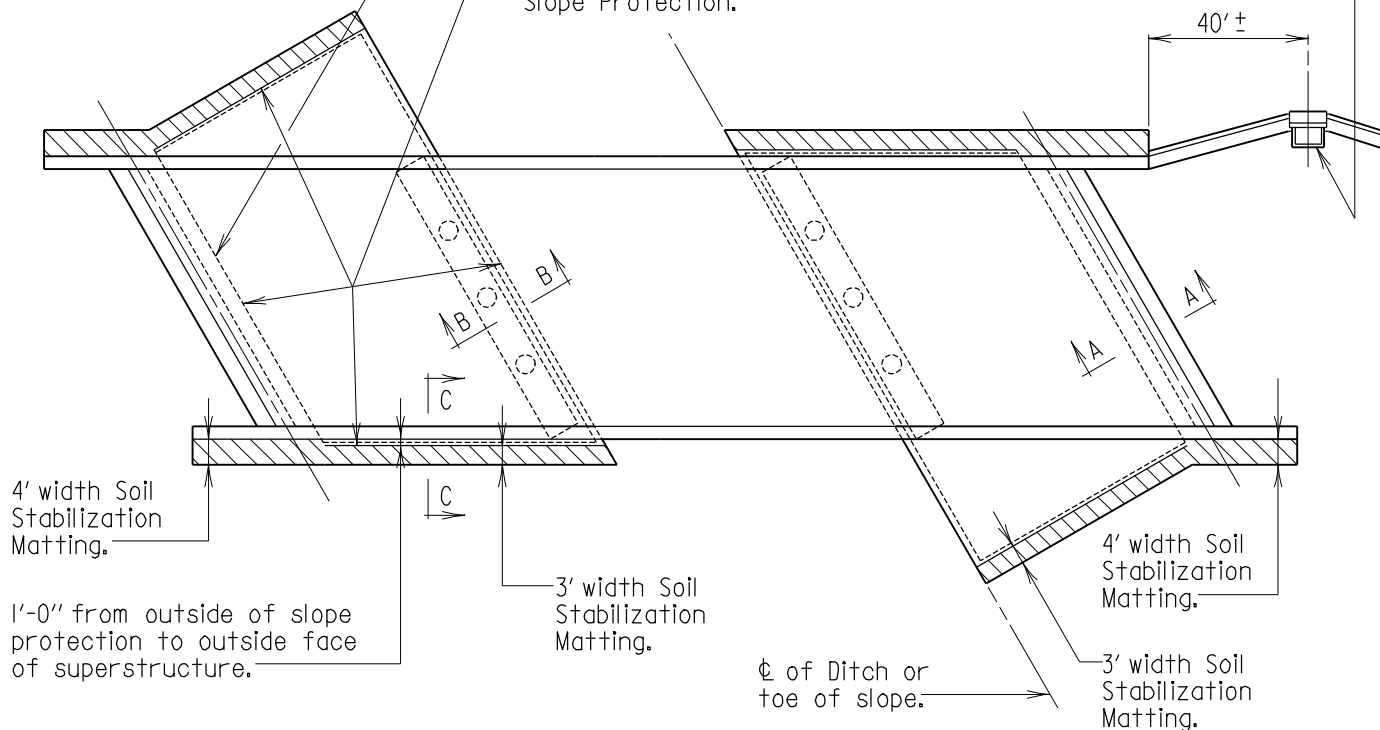
SHEET 1 OF 1

MISCELLANEOUS

Front face of Abutment.

Limits of measurement  
for basis of Payment for  
Slope Protection.

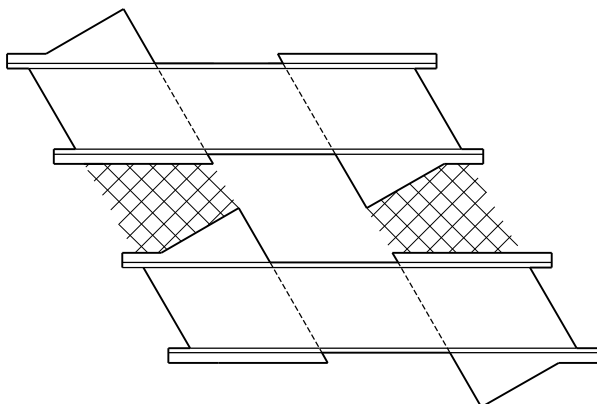
Place Inlet on all downhill  
end(s) where crown is forcing  
water to that location.



Soil Stabilization Matting  
shown hatched.

PLAN

Scale: None



SKETCH-PLAN

Note:

On dual bridges where perpendicular distance  
between bridge faces is less than 30' or on skewed  
dual bridges if where the unprotected area for both  
ends of the bridges (hatched areas in  
sketch-Plan) were added is less  
than 200 sq. ft. then slope protection  
is to be continuous thru median  
area.

Notes:

1. For Sections A-A, B-B, and C-C see  
sheets 2 thru 6 of 6.
2. If limits for slope protection are  
shown on Contract Drawings, then  
those limits take precedent over  
what is shown on this sheet.

Slanted lettering Indicate notes "For Office Use Only".

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<i>E.S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 4/15/78	
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8-3-81	8-20-81
9-25-81	11-25-85
3-21-89	6-8-90
11-15-95	

FHWA APPROVAL  
DATE: 10-17-78

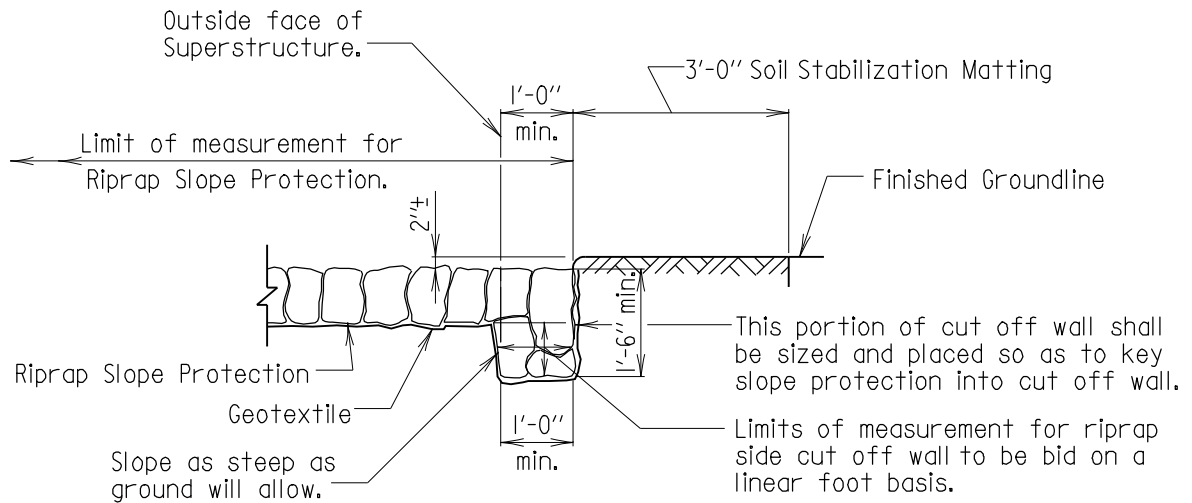
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SLOPE PROTECTION FOR BRIDGES  
CARRYING ROAD OVER ROAD OR RAILROADS

STANDARD NO. M(6.02)-78-75

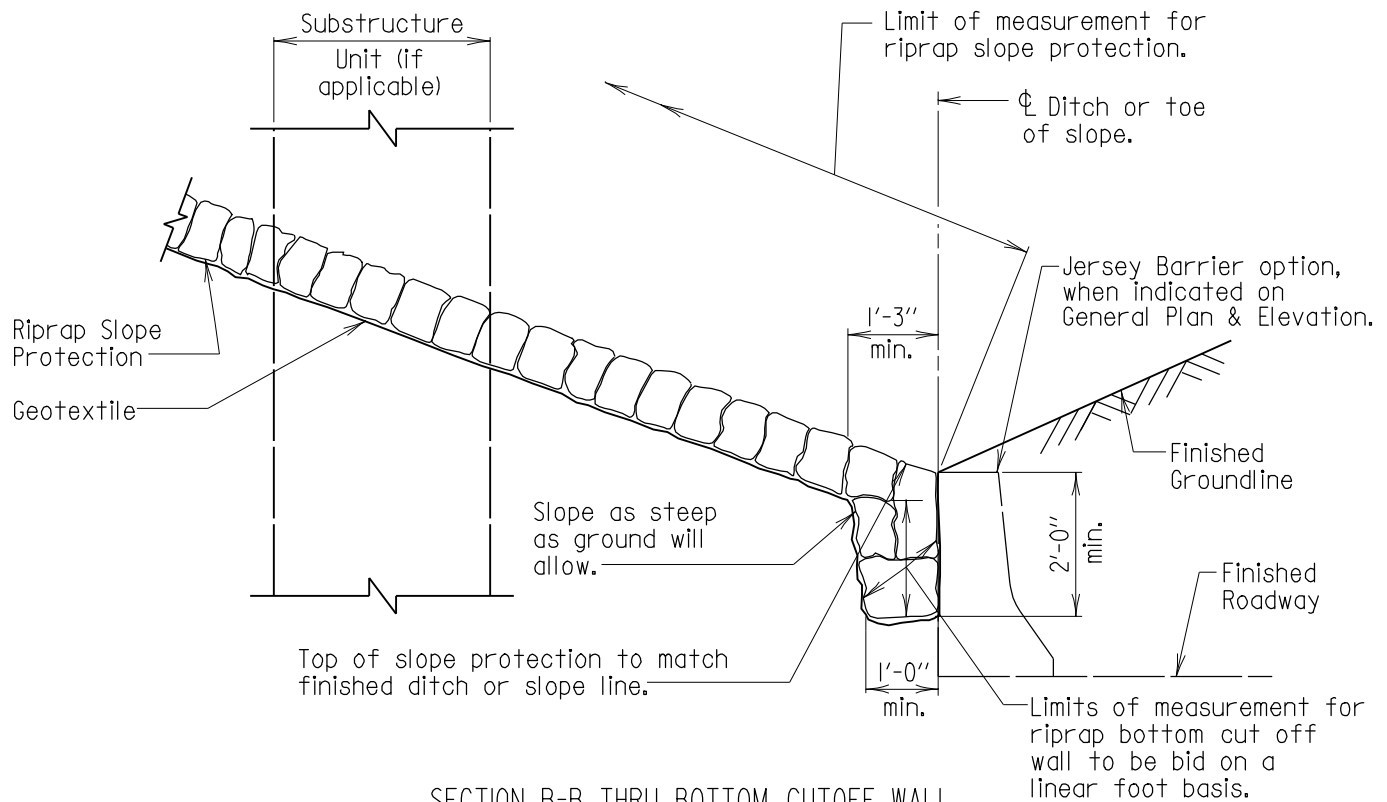
SHEET 1 OF 6

MISCELLANEOUS



### SECTION C-C THRU SIDE OF CUTOFF WALL

Scale:  $\frac{3}{8}$ " = 1'-0"



### SECTION B-B THRU BOTTOM CUTOFF WALL

Scale:  $\frac{3}{8}$ " = 1'-0"

Note:  
If a barrier configuration is used at bottom of slope, the bottom cut off wall shall be eliminated.

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3-15-90	6-8-90
11-15-95	.
1-22-01	.
6-29-05	.

FHWA APPROVAL  
DATE: 11-29-85

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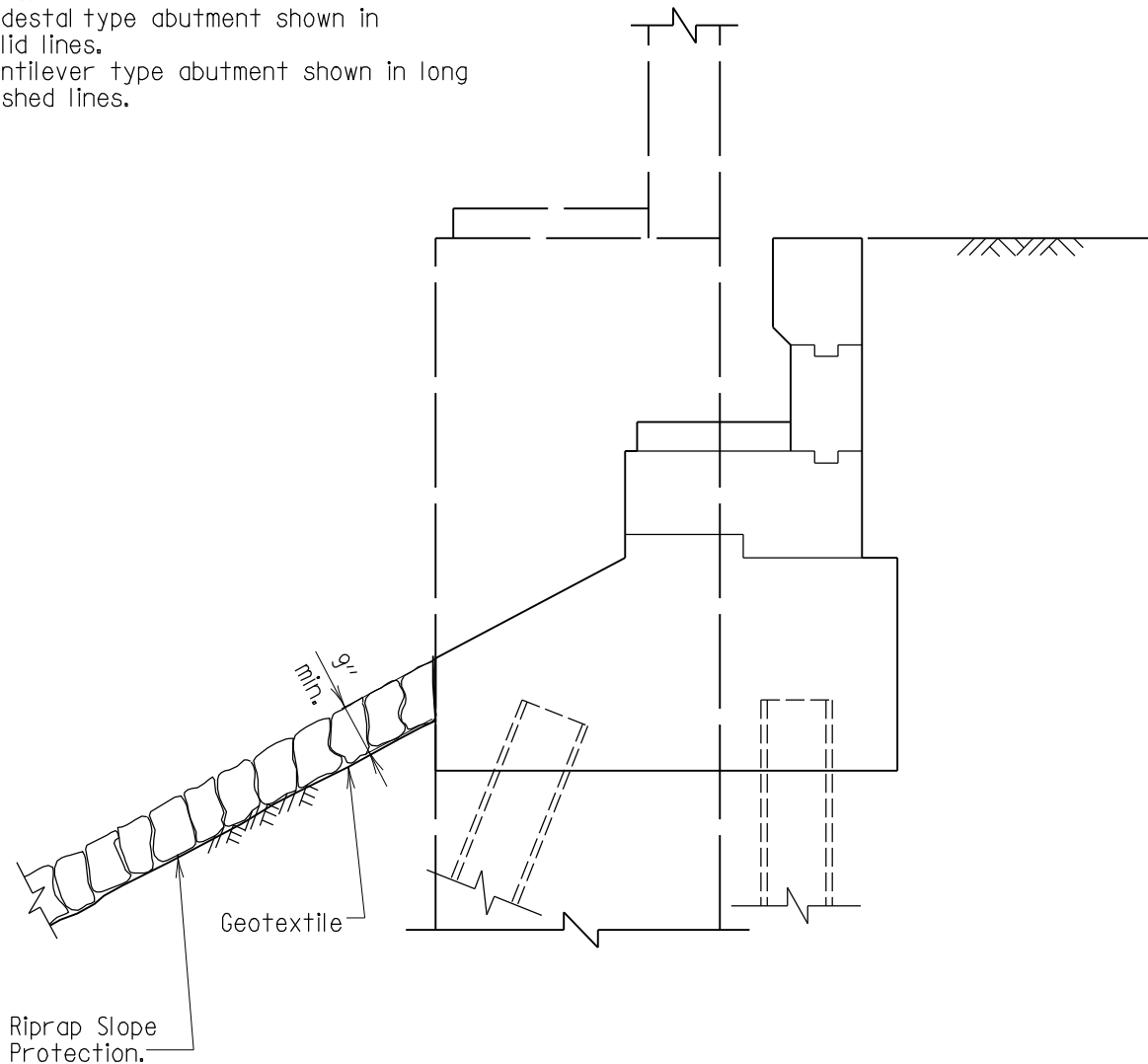
RIPRAP SLOPE PROTECTION FOR BRIDGES  
CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75

SHEET 2 OF 6

MISCELLANEOUS

Note:  
 Pedestal type abutment shown in  
 solid lines.  
 Cantilever type abutment shown in long  
 dashed lines.



SECTION A-A THRU ABUTMENT

Scale: " = 1'-0"

Notes:

1. Bottom cut off wall may be eliminated if slope protection can be founded in rock.
2. All material for riprap slope protection shall be Class I conforming to 901.02.
3. Refer to Section 312 for other requirements.

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1-22-01	.
7-26-06	.
5-19-09	.

FHWA APPROVAL  
 DATE: 6-8-90

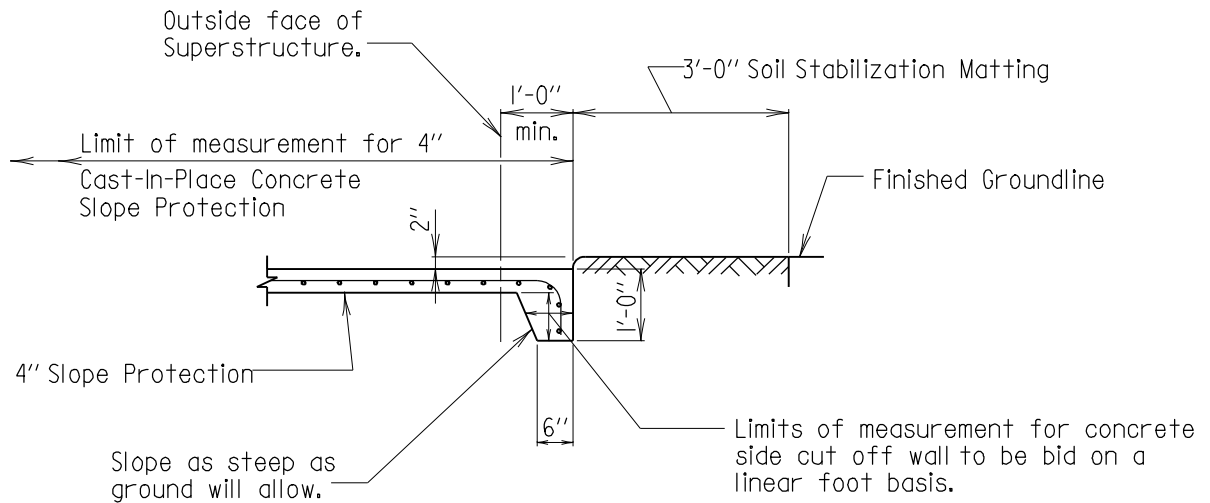
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RIPRAP SLOPE PROTECTION FOR BRIDGES  
 CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75

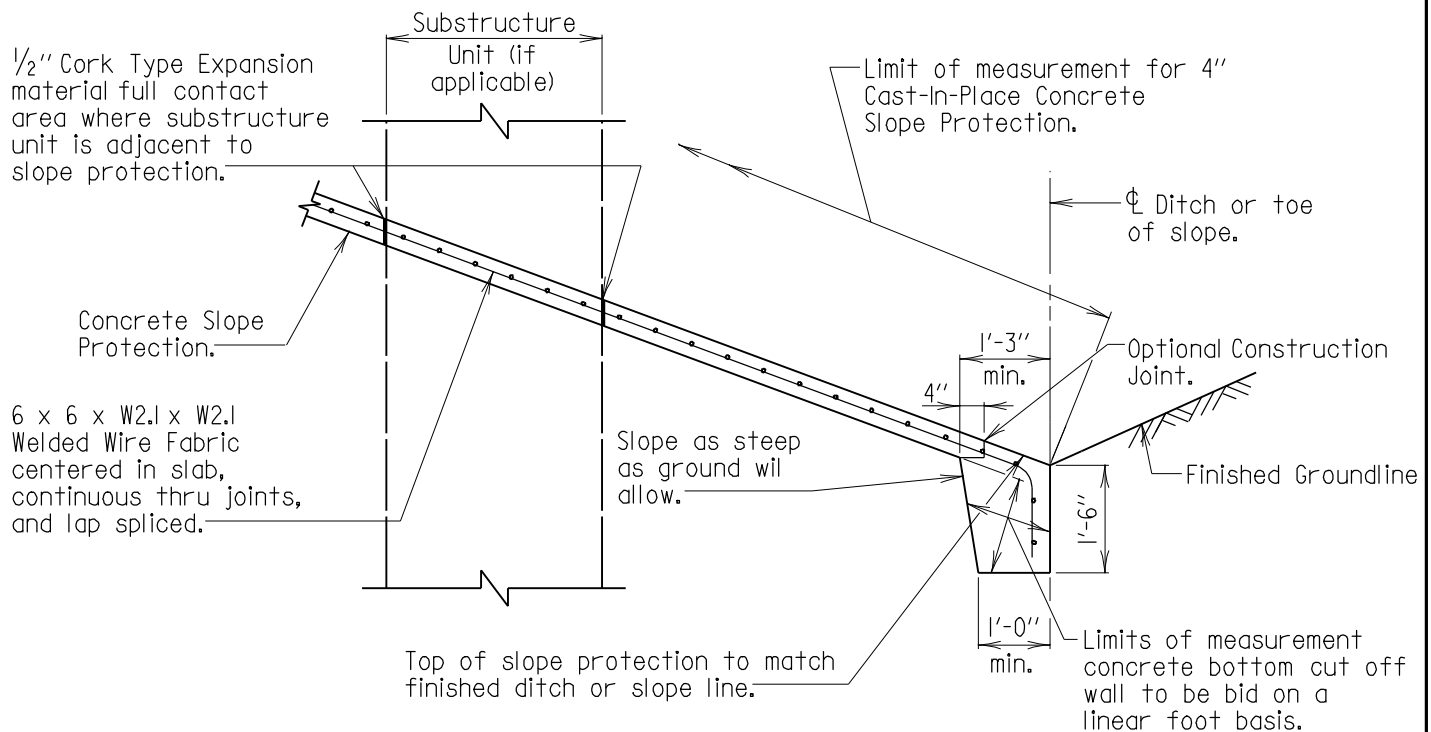
SHEET 3 OF 6

MISCELLANEOUS



### SECTION C-C THRU SIDE OF CUTOFF WALL

Scale:  $\frac{3}{8}'' = 1'-0''$



### SECTION B-B BOTTOM OF CUTOFF WALL

Scale:  $\frac{3}{8}'' = 1'-0''$

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11-15-95	
1-22-01	

FHWA APPROVAL  
DATE: 10-17-78

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CONCRETE SLOPE PROTECTION FOR BRIDGES  
CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75

SHEET 4 OF 6

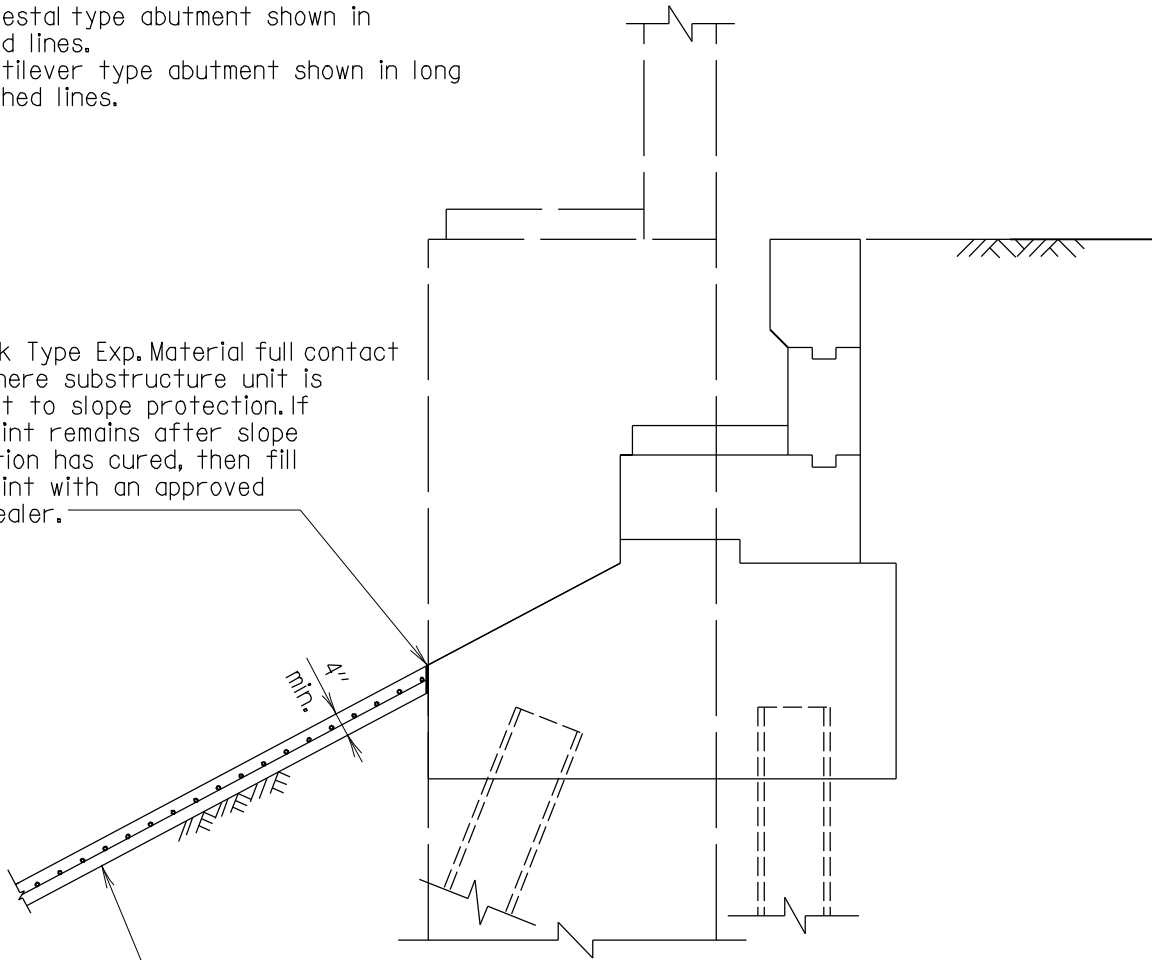
MISCELLANEOUS



Note:  
 Pedestal type abutment shown in  
 solid lines.  
 Cantilever type abutment shown in long  
 dashed lines.

1/2" Cork Type Exp. Material full contact  
 area where substructure unit is  
 adjacent to slope protection. If  
 open joint remains after slope  
 protection has cured, then fill  
 open joint with an approved  
 joint sealer.

Concrete  
 Slope Protection



SECTION A-A THRU ABUTMENT

Scale:  $\frac{3}{8}'' = 1'-0''$

Notes:

1. Bottom cut off wall may be eliminated if slope protection can be founded in rock.
2. Refer to Section 310 for other requirements.

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2-22-00	.
4-17-00	.
1-22-01	.
7-26-06	.

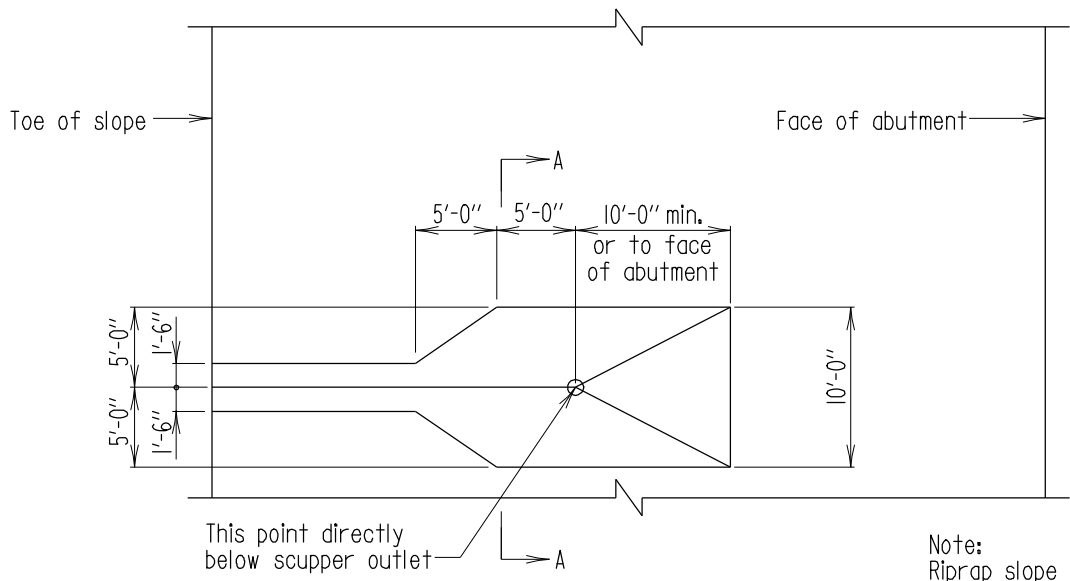
FHWA APPROVAL  
 DATE: 6-8-90

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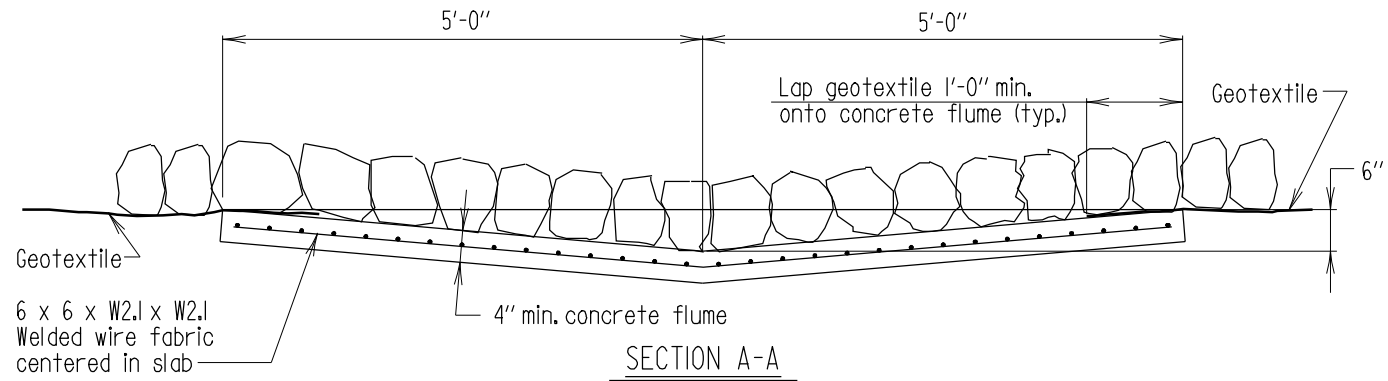
CONCRETE SLOPE PROTECTION FOR BRIDGES  
 CARRYING ROAD OVER ROAD OR RAILROAD

STANDARD NO. M(6.02)-78-75

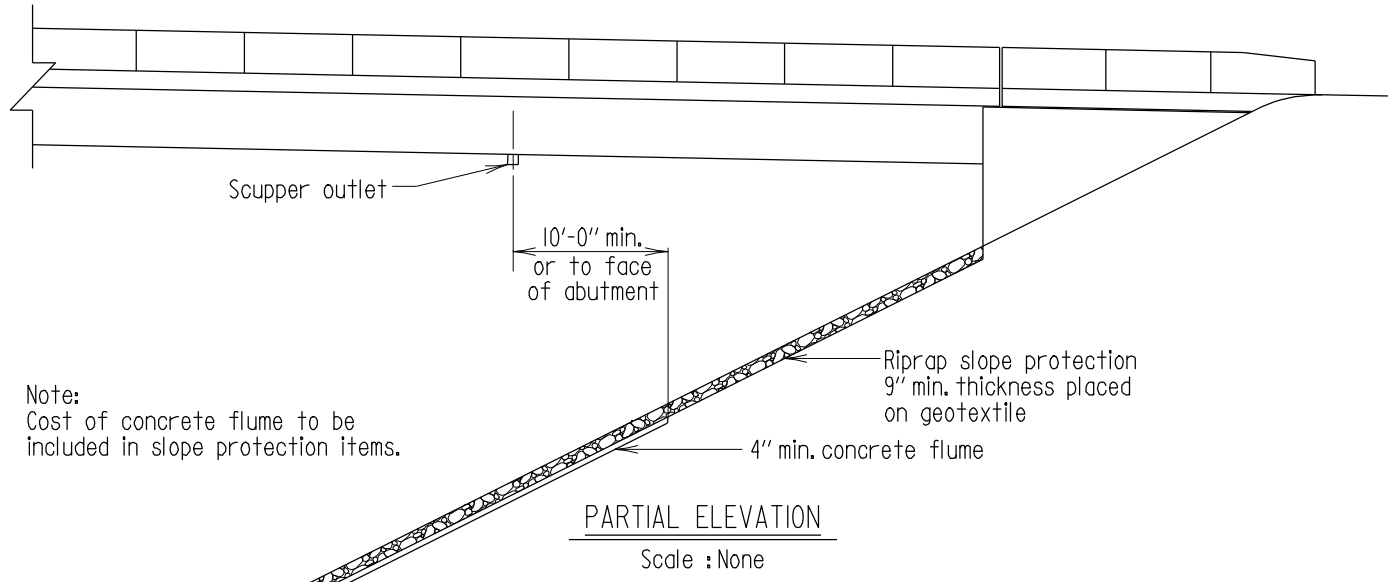
SHEET 5 OF 6



**PLAN**  
Scale : None



**SECTION A-A**  
Scale : 1/2" = 1'-0"



**PARTIAL ELEVATION**  
Scale : None

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<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 11/15/95	
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11-15-95	.
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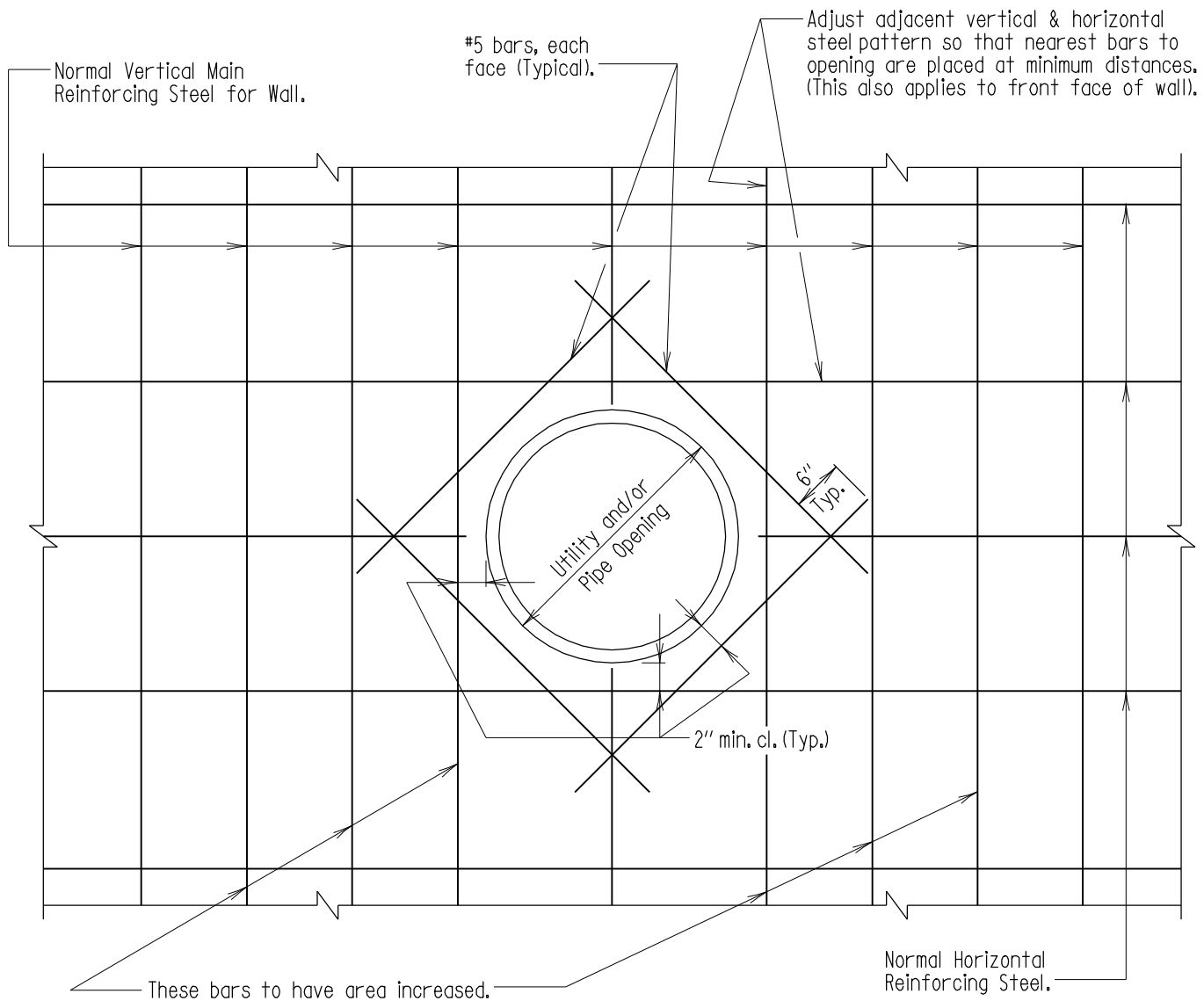
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CONCRETE SPLASH BLOCK  
ON END SLOPE WITH  
RIPRAP SLOPE PROTECTION

STANDARD NO. M(6.02)-78-75

SHEET 6 OF 6

MISCELLANEOUS



ELEVATION  
Scale: None

Note:

1. Increase the size of each of the first three normal main vertical reinforcing steel bars, on each side of the wall opening. New bar size shall be such that each increase in bar area shall at least equal  $\frac{1}{6}$  the total area of the main reinforcing steel that has been cut.
2. When pipe size is over 3'-0", sufficient horizontal bars shall be added over and below opening to transfer load to adjacent full sections of wall.
3. In no case shall concrete cover be less than 2".

FHWA APPROVAL  
DATE: 12-12-79

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DATE: 7/26/79	
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SHA	FHWA
12-4-84	6-8-90
7-2-93	.
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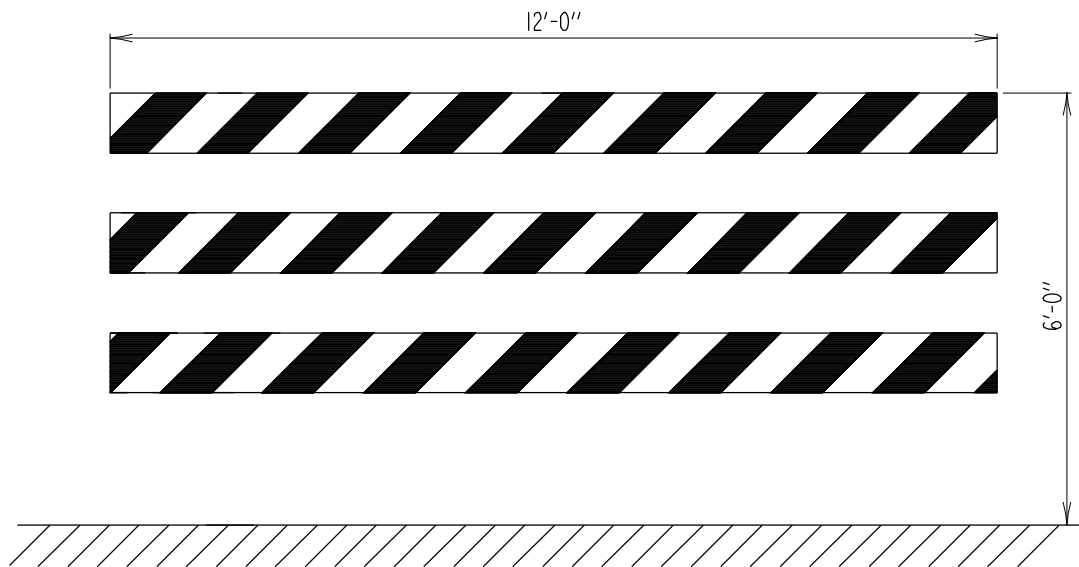
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REINFORCEMENT ADJUSTMENT  
AT UTILITY AND/OR PIPE OPENING IN WALL

STANDARD NO. M(6.03)-79-77

SHEET 1 OF 1

MISCELLANEOUS



ELEVATION  
Scale:  $\frac{3}{8}'' = 1'-0''$

Notes:

1. Type III Barricade shall conform to NCHRP Report 350 and the MUTCD except that all barricades to close structures shall be 12 ft.long by 6 ft.high.
2. Striping shall be reflectorized alternate orange and white colors. Right (R) Barricade shown. (L) barricade shall have stripes sloping in opposite direction. If barricades are to be used close road, striping shall be reflectorized alternate white and red colors.
3. Barricade shall be lighted if required by location.
4. Type III Barricades shall be selected from the Preapproved List maintained by the Office of Materials and Technology. Procedures for adding products to the prequalified list may be obtained from the Office of Materials and Technology.
5. If signing is attached to the movable barricade, the signs shall be placed so that no more than 1/3 of the reflective surface of the barricade shall be covered.

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DATE: 8/31/79	
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12-12-05	.
1-6-06	.
7-24-07	.
FHWA APPROVAL	
DATE: 1-16-80	

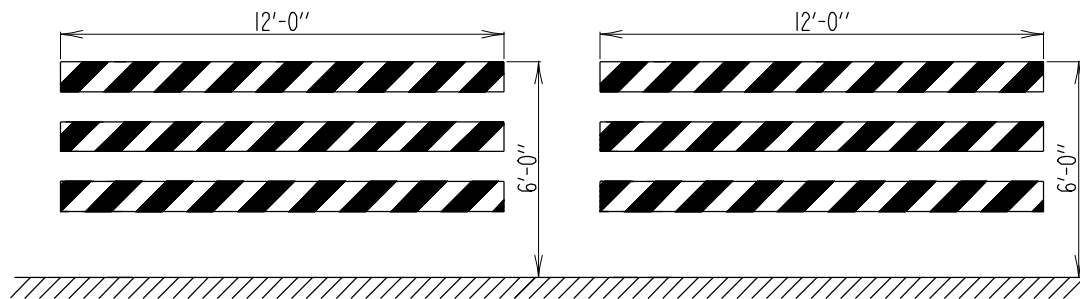
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TEMPORARY MOVABLE BARRICADE

STANDARD NO. M(5.08)-79-82

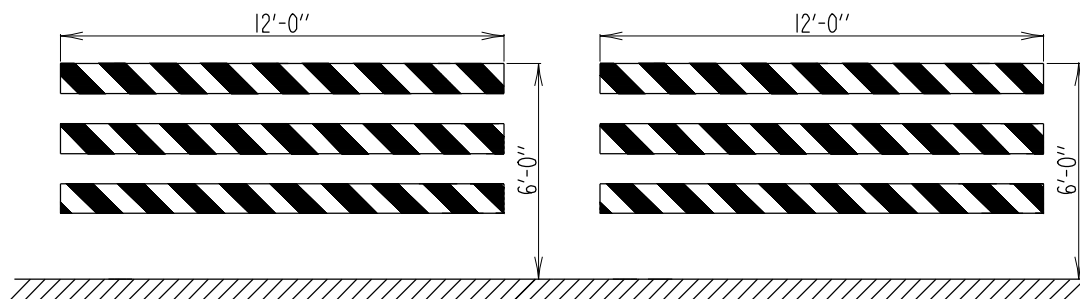
SHEET 1 OF 2

MISCELLANEOUS



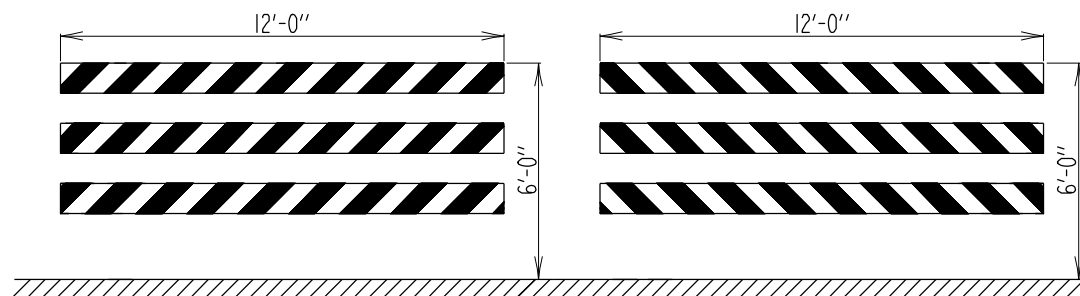
ELEVATION-ROAD CLOSED, TRAFFIC DIRECTED TO LEFT

Scale:  $\frac{3}{16}'' = 1'-0''$



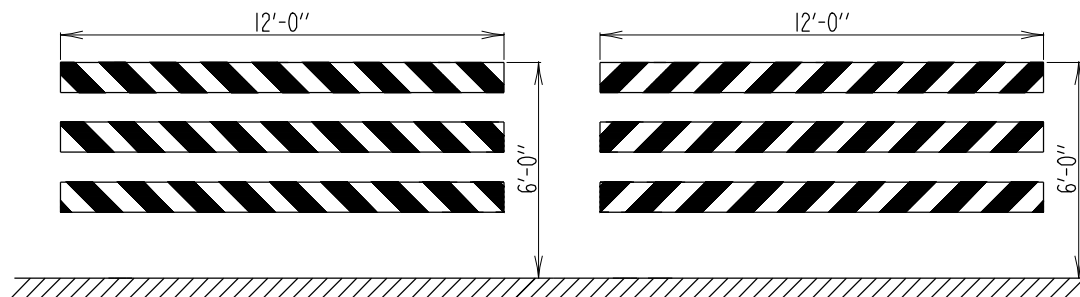
ELEVATION-ROAD CLOSED, TRAFFIC DIRECTED TO RIGHT

Scale:  $\frac{3}{16}'' = 1'-0''$



ELEVATION-ROAD CLOSED, TRAFFIC DIRECTED TO EITHER SIDE

Scale:  $\frac{3}{16}'' = 1'-0''$



ELEVATION-ROAD CLOSED USING WHITE AND RED STRIPES

Scale:  $\frac{3}{16}'' = 1'-0''$

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
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FHWA APPROVAL  
DATE: .

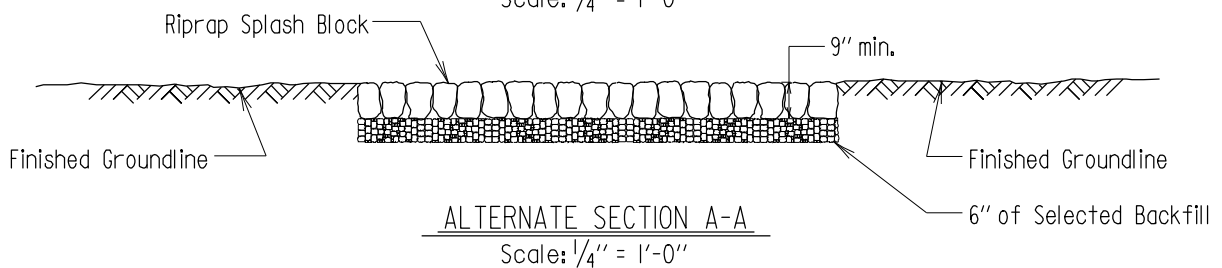
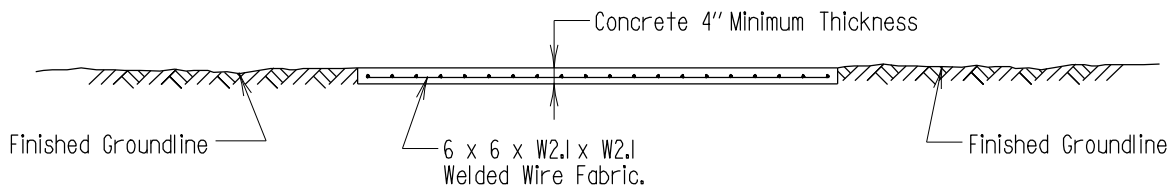
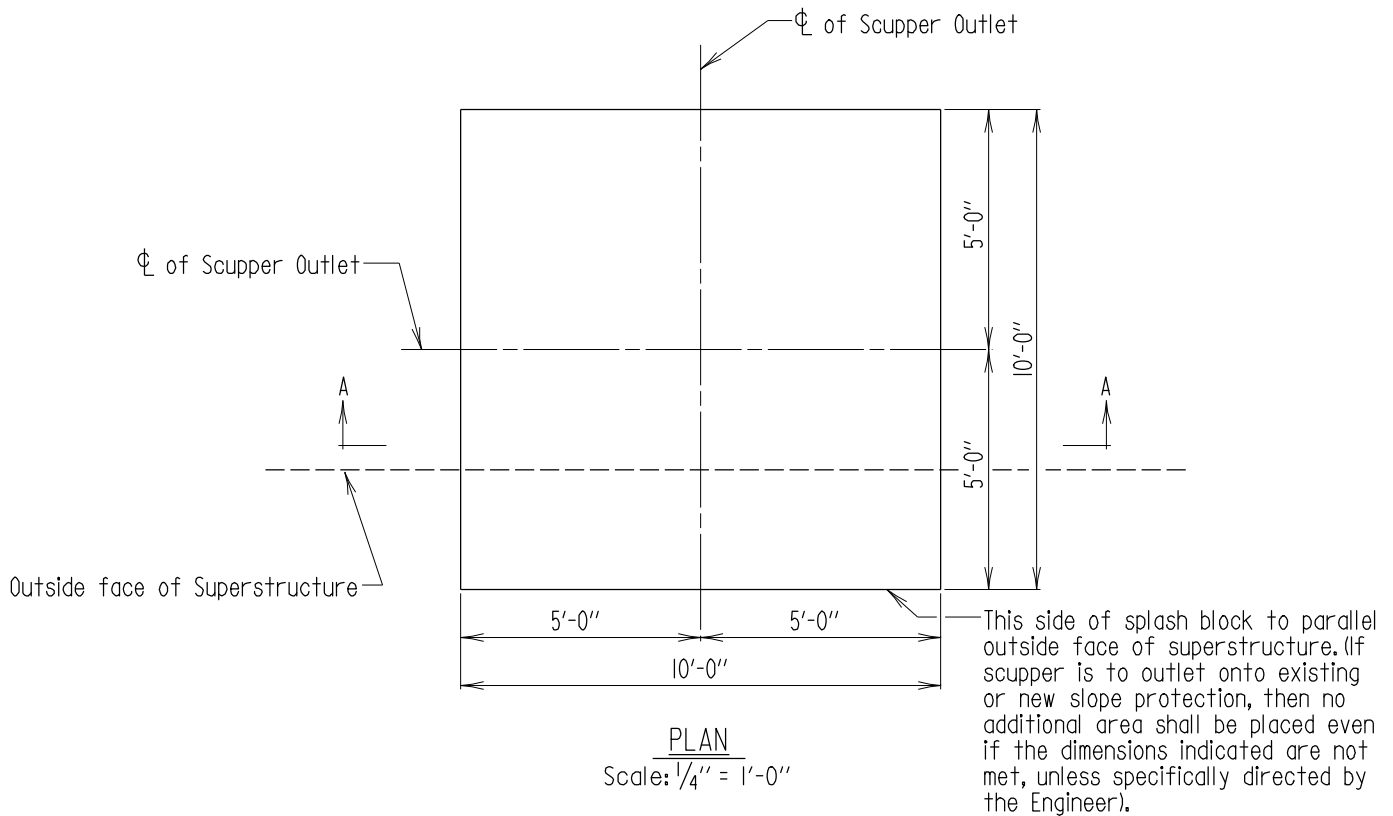
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TEMPORARY MOVABLE BARRICADE

STANDARD NO. M(5.08)-79-82

SHEET 2 OF 2

MISCELLANEOUS



Note:

1. Splash blocks shall be placed at all scuppers that do not directly outlet onto slope protection or into water and are less than 40' above finished ground.
2. Concrete shall be Mix. No. 1 or better.
3. Cost of splash block(s) complete in place, regardless of alternate (including Selected Backfill) shall be measured and paid for at Contract unit price bid on Slope Protection item. If there is no slope protection in the project then cost to be included in Contract price bid on Scuppers or whichever item(s) scuppers are included in.
4. Alternate Section A-A is to be utilized when riprap slope protection is specified for slopes of bridge. All material for riprap for splash block shall conform to the same requirements for the other riprap slope protection for bridge.

APPROVAL	
<i>L. S. Friedman</i>	DIRECTOR
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DATE: 11/14/80	
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7-28-82	8-24-82
5-6-83	11-29-85
2-14-94	
1-22-01	

FHWA APPROVAL  
DATE: 8-20-81

STATE OF MARYLAND  
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SPLASH BLOCKS FOR  
SCUPPER OUTLETS

STANDARD NO. M(6.04)-80-119

SHEET 1 OF 1

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-4"	3'-1"	2'-6"
#8	5'-8"	4'-1"	3'-3"
#9	7'-2"	5'-1"	4'-1"
#10	9'-1"	6'-6"	5'-2"
#11	11'-1"	7'-11"	6'-4"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL	
<i>LS Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 4/30/81	
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1-22-01	.
11-23-93	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
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STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.05)-80-122

SHEET 1 OF 3

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1½"	3"	3½"
#5	3'-8"	3'-3"	2'-7"	1⅞"	3¾"	4⅜"
#6	4'-5"	3'-10"	3'-1"	2¼"	4½"	5¼"
#7	5'-3"	4'-7"	3'-8"	2⅝"	5¼"	6⅛"
#8	6'-10"	6'-1"	4'-10"	3"	6"	7"
#9	8'-8"	7'-8"	6'-1"	3⅜"	6¾"	7⅞"
#10	11'-0"	9'-8"	7'-9"	3¾"	7⅝"	8⅞"
#11	13'-6"	11'-11"	9'-6"	4¼"	8½"	9⅞"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.05)-80-122

SHEET 2 OF 3



BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-4"	3'-1"	2'-6"
#7	5'-1"	Does Not Exist	2'-11"
#8	6'-8"		3'-10"
#9	8'-5"		4'-10"
#10	10'-9"		6'-2"
#11	13'-2"		7'-7"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, CASE NO.2 - For bars coated with epoxy not in Case No.1, the above dimensions shall be used.  
 2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.  
 3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
 DEPARTMENT OF TRANSPORTATION  
 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES  
 BAR LAP DIMENSIONS FOR  
 GRADE 60 REINFORCING STEEL  
 IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
 EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.05)-80-122

SHEET 3 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-4"	3'-1"	2'-6"
#8	5'-8"	4'-1"	3'-3"
#9	7'-2"	5'-1"	4'-1"
#10	9'-1"	6'-6"	5'-2"
#11	11'-1"	7'-11"	6'-4"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 4/30/81	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING



STANDARD NO. M(6.05)-80-122(L)

SHEET 1 OF 3

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-5"	3'-10"	3'-1"	2 1/4"	4 1/2"	5 1/4"
#7	5'-3"	4'-7"	3'-8"	2 5/8"	5 1/4"	6 1/8"
#8	6'-10"	6'-1"	4'-10"	3"	6"	7"
#9	8'-8"	7'-8"	6'-1"	3 3/8"	6 3/4"	7 7/8"
#10	11'-0"	9'-8"	7'-9"	3 3/4"	7 5/8"	8 7/8"
#11	13'-6"	11'-11"	9'-6"	4 1/4"	8 1/2"	9 7/8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.05)-80-122(L)

SHEET 2 OF 3



MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-4"	3'-1"	2'-6"
#7	5'-1"	Does Not Exist	2'-11"
#8	6'-8"		3'-10"
#9	8'-5"		4'-10"
#10	10'-9"		6'-2"
#11	13'-2"		7'-7"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
B - All bars not in Category A spaced less than 6" apart.  
C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, CASE NO.2 - For bars coated with epoxy not in Case No.1. the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.2

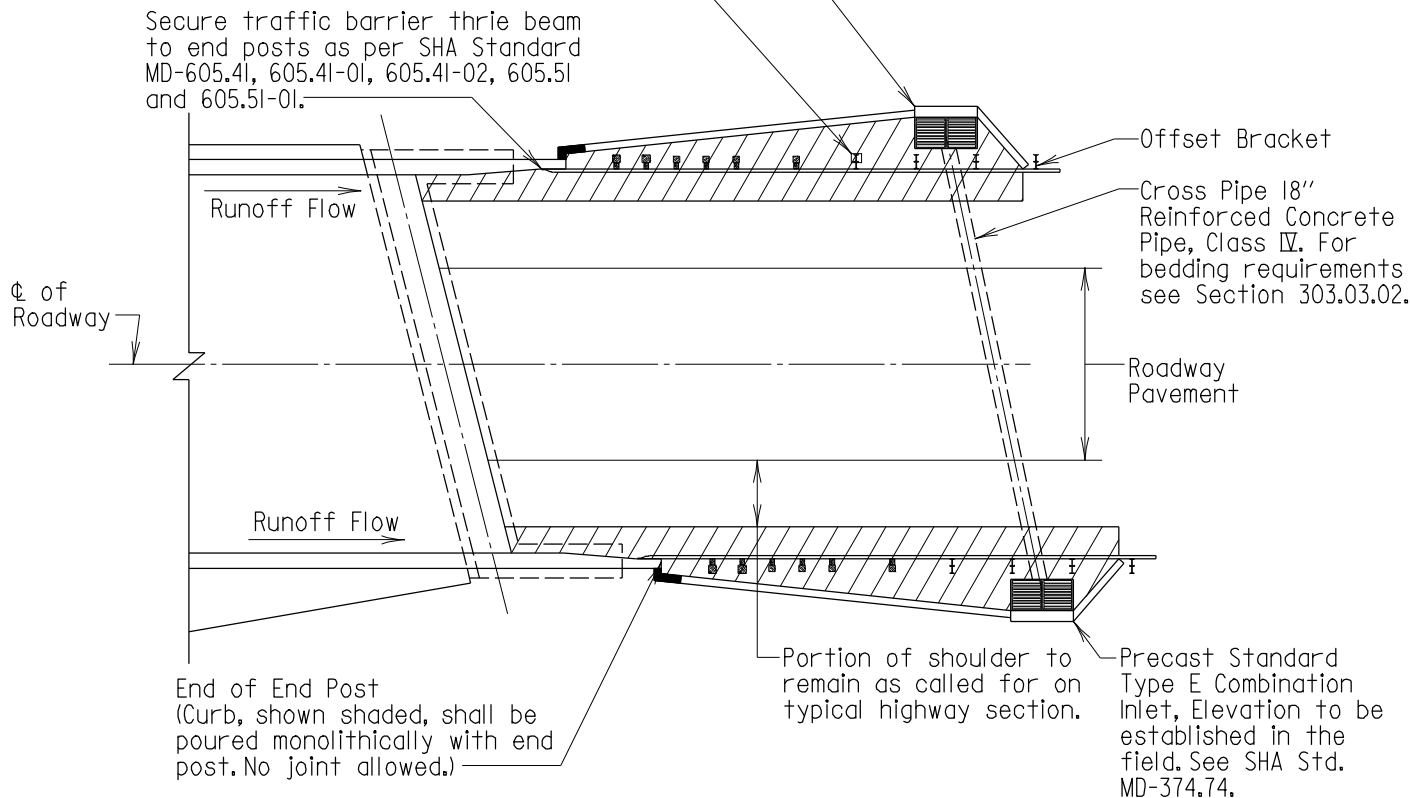


STANDARD NO. M(6.05)-80-122(L)

SHEET 3 OF 3

District Engineer shall have option of requiring sockets, placing posts, and filling with 9"± of grout, (grout in accordance with Standard Specification Section 902.11) sloped to drain, as second stage construction.

If inlets are required at each side of bridge, and distance between inlets is less than 60', then cross pipe shall be considered with outlet used on lower inlet. If length is greater than 60' or it would be more economical to provide a separate outlet for pipes less than 60', then each inlet shall have its own outlet pipe, etc. For details see sht. 2 of 2.



PLAN

Scale: 1" = 20'-0"

Notes:

1. Payment for Drainage Inlet at End of Bridge Structure shall be on an each basis. Cost for entire installation of hatched area, curb and gutter, inlet, etc. Cross pipe, outlet pipe, elbows and concrete end section shall be incidental to the unit cost of inlet. Outlet pad will be paid for separately.
2. Open Approach Roadway is defined as a highway with full shoulders, no curbed sections, sidewalks and/or raised medians.
3. See note on General Plan and Elevation as to which ends of structure will require inlets.
4. Traffic barrier posts shall be driven prior to placing concrete gutter pan except if option above is utilized.
5. See sheet 2 of 2 for additional details.

APPROVAL	
<i>E. S. Trueman</i>	DEPUTY
CHIEF ENGR. BRIDGE DEVL.	
DATE: 12/23/80	
REVISIONS	
SHA	FHWA
1-22-98	.
2-11-00	.
4-23-04	.
1-30-07	.

FHWA APPROVAL  
DATE: 5-6-81

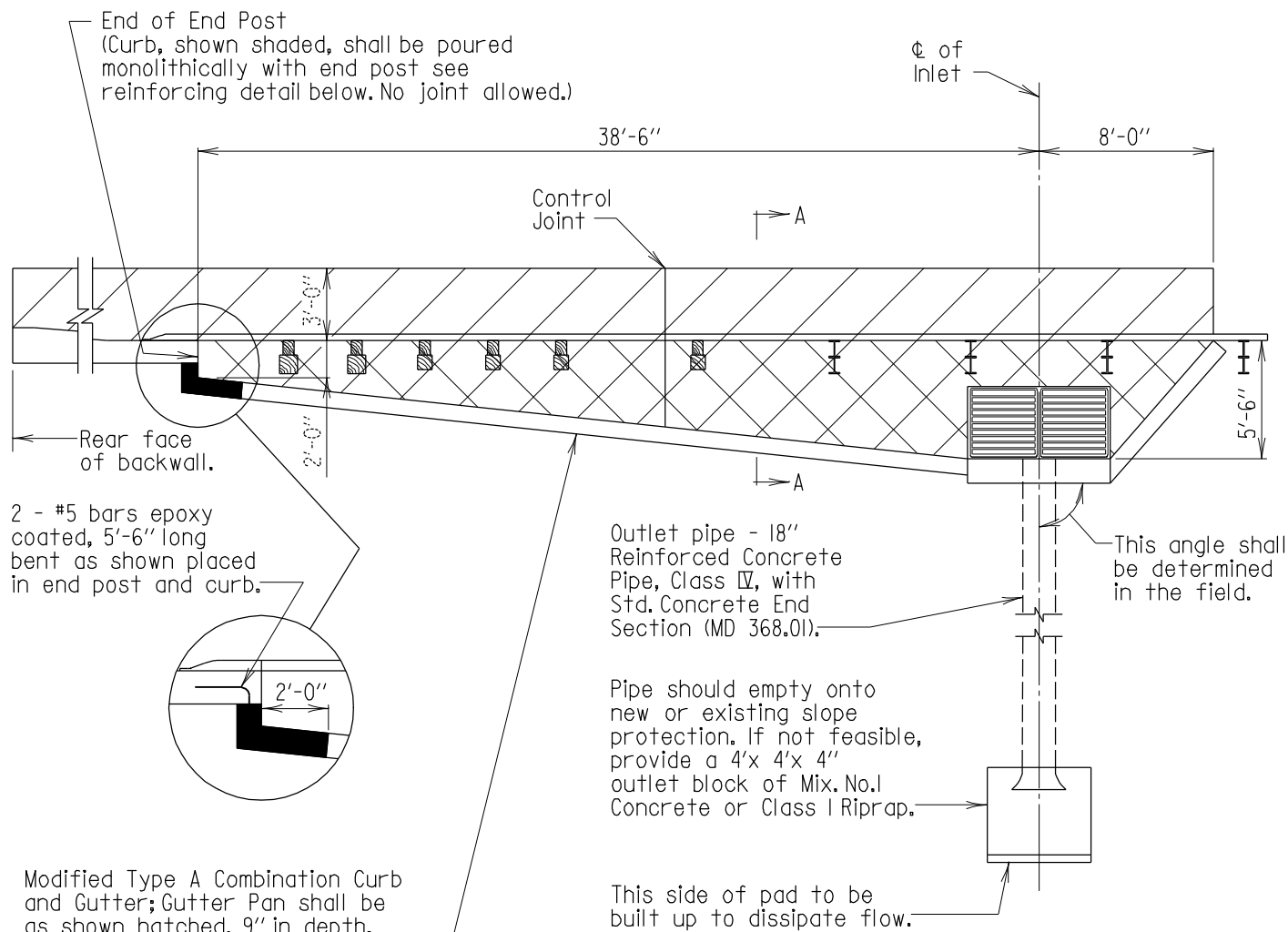
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

DRAINAGE INLET  
AT END OF BRIDGE STRUCTURE  
(OPEN APPROACH ROADWAY)

STANDARD NO. M(0.03)-80-123

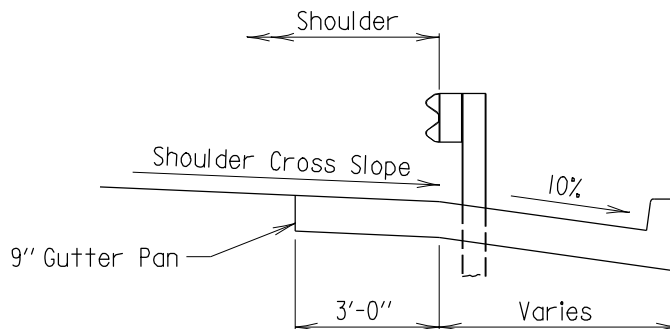
SHEET 1 OF 2

MISCELLANEOUS



### PLAN OF INLET AREA

Scale:  $\frac{1}{8}" = 1'-0"$



### SECTION A-A

Scale:  $\frac{1}{4}" = 1'-0"$

APPROVAL	
<i>E.S. Freedom</i>	DEPUTY
CHIEF ENGR. BRIDGE DEVL.	
DATE: 10/22/90	
REVISIONS	
SHA	FHWA
1-7-97	
2-11-00	
1-30-07	
FHWA APPROVAL	
DATE:	

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

DRAINAGE INLET  
AT END OF BRIDGE STRUCTURE  
(OPEN APPROACH ROADWAY)

STANDARD NO. M(0.03)-80-123

SHEET 2 OF 2

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-2"	2'-4"	1'-10"
#5	4'-0"	2'-10"	2'-4"
#6	4'-9"	3'-5"	2'-9"
#7	5'-8"	4'-1"	3'-3"
#8	7'-6"	5'-4"	4'-4"
#9	9'-6"	6'-9"	5'-5"
#10	12'-0"	8'-7"	6'-11"
#11	14'-9"	10'-7"	8'-5"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps only apply to 4500 p.s.i. lightweight concrete.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 4/30/81	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
STANDARD NO. M(6.06)-81-126	SHEET <u>1</u> OF <u>3</u>

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	3'-11"	3'-5"	2'-9"	1½"	3"	3½"
#5	4'-10"	4'-3"	3'-5"	1⅞"	3¾"	4⅜"
#6	5'-10"	5'-2"	4'-1"	2¼"	4½"	5¼"
#7	6'-11"	6'-1"	4'-11"	2⅝"	5¼"	6⅛"
#8	9'-1"	8'-0"	6'-5"	3"	6"	7"
#9	11'-6"	10'-2"	8'-2"	3⅜"	6¾"	7⅞"
#10	14'-7"	12'-11"	10'-4"	3¾"	7⅝"	8⅞"
#11	17'-11"	15'-10"	12'-8"	4¼"	8½"	9⅞"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps only apply to 4500 p.s.i. lightweight concrete.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L. S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.
FHWA APPROVAL	
DATE:	

<p>STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1</p>		
STANDARD NO. M(6.06)-81-126		SHEET <u>2</u> OF <u>3</u>

MISCELLANEOUS



BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-9"	2'-8"	2'-2"
#5	4'-8"	3'-4"	2'-8"
#6	5'-7"	4'-0"	3'-3"
#7	6'-7"	Does Not Exist	3'-10"
#8	8'-8"		5'-0"
#9	11'-0"		6'-4"
#10	13'-11"		8'-0"
#11	17'-1"		9'-10"

#### \* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

#### Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps only apply to 4500 p.s.i. lightweight concrete.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.2 - For bars coated with epoxy not in Case No.1.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	
1-22-01	
9-20-05	
12-4-07	

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. M(6.06)-81-126	SHEET <u>3</u> OF <u>3</u>

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-2"	2'-4"	1'-10"
#5	4'-0"	2'-10"	2'-4"
#6	4'-9"	3'-5"	2'-9"
#7	5'-8"	4'-1"	3'-3"
#8	7'-6"	5'-4"	4'-4"
#9	9'-6"	6'-9"	5'-5"
#10	12'-0"	8'-7"	6'-11"
#11	14'-9"	10'-7"	8'-5"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps only apply to 4500 p.s.i. lightweight concrete.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 4/30/81	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING



STANDARD NO. M(6.06)-81-126(L)

SHEET 1 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	3'-11"	3'-5"	2'-9"	1 1/2"	3"	3 1/2"
#5	4'-10"	4'-3"	3'-5"	1 7/8"	3 3/4"	4 3/8"
#6	5'-10"	5'-2"	4'-1"	2 1/4"	4 1/2"	5 1/4"
#7	6'-11"	6'-1"	4'-11"	2 5/8"	5 1/4"	6 1/8"
#8	9'-1"	8'-0"	6'-5"	3"	6"	7"
#9	11'-6"	10'-2"	8'-2"	3 3/8"	6 3/4"	7 7/8"
#10	14'-7"	12'-11"	10'-4"	3 3/4"	7 5/8"	8 7/8"
#11	17'-11"	15'-10"	12'-8"	4 1/4"	8 1/2"	9 7/8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.


Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps only apply to 4500 p.s.i. lightweight concrete.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. M(6.06)-81-126(L)	SHEET 2 OF 3

MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-9"	2'-8"	2'-2"
#5	4'-8"	3'-4"	2'-8"
#6	5'-7"	4'-0"	3'-3"
#7	6'-7"	Does Not Exist	3'-10"
#8	8'-8"		5'-0"
#9	11'-0"		6'-4"
#10	13'-11"		8'-0"
#11	17'-1"		9'-10"

#### \* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps only apply to 4500 p.s.i. lightweight concrete.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.2 - For bars coated with epoxy not in Case No.1.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	
1-22-01	
9-20-05	
11-26-07	

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. M(6.06)-81-126(L)	SHEET <u>3</u> OF <u>3</u>



MISCELLANEOUS

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-10"	3'-6"	2'-10"
#8	6'-5"	4'-7"	3'-8"
#9	8'-1"	5'-9"	4'-8"
#10	10'-3"	7'-4"	5'-11"
#11	12'-7"	9'-0"	7'-3"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."

APPROVAL	
<i>L. S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 4/30/81	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.
FHWA APPROVAL	
DATE: 6-8-90	

STATE OF MARYLAND  
 DEPARTMENT OF TRANSPORTATION  
 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES

BAR LAP DIMENSIONS FOR  
 GRADE 60 REINFORCING STEEL  
 IN MIX NO.3 (3500 P.S.I.) CONCRETE  
 NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.07)-81-127

SHEET 1 OF 3

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-5"	3'-10"	3'-1"	2 1/4"	4 1/2"	5 1/4"
#7	5'-11"	5'-3"	4'-2"	2 5/8"	5 1/4"	6 1/8"
#8	7'-9"	6'-10"	5'-6"	3"	6"	7"
#9	9'-10"	8'-8"	6'-11"	3 3/8"	6 3/4"	7 7/8"
#10	12'-5"	11'-0"	8'-10"	3 3/4"	7 5/8"	8 7/8"
#11	15'-3"	13'-6"	10'-10"	4 1/4"	8 1/2"	9 7/8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>E.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. M(6.07)-81-127	SHEET <u>2</u> OF <u>3</u>

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-4"	3'-1"	2'-6"
#7	5'-9"	Does Not Exist	3'-4"
#8	7'-7"		4'-4"
#9	9'-7"		5'-6"
#10	12'-2"		7'-0"
#11	14'-11"		8'-7"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
B - All bars not in Category A spaced less than 6" apart.  
C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.2 - For bars coated with epoxy not in Case No.1.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: .

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. M(6.07)-81-127	SHEET <u>3</u> OF <u>3</u>

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-10"	3'-6"	2'-10"
#8	6'-5"	4'-7"	3'-8"
#9	8'-1"	5'-9"	4'-8"
#10	10'-3"	7'-4"	5'-11"
#11	12'-7"	9'-0"	7'-3"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 4/30/81	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.
FHWA APPROVAL	
DATE: 6-8-90	

STATE OF MARYLAND  
 DEPARTMENT OF TRANSPORTATION  
 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES

BAR LAP DIMENSIONS FOR  
 GRADE 60 REINFORCING STEEL  
 IN MIX NO.3 (3500 P.S.I.) CONCRETE  
 NON-EPOXY COATED REINFORCING



STANDARD NO. M(6.07)-81-127(L)

SHEET 1 OF 3



BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-5"	3'-10"	3'-1"	2 1/4"	4 1/2"	5 1/4"
#7	5'-11"	5'-3"	4'-2"	2 5/8"	5 1/4"	6 1/8"
#8	7'-9"	6'-10"	5'-6"	3"	6"	7"
#9	9'-10"	8'-8"	6'-11"	3 3/8"	6 3/4"	7 7/8"
#10	12'-5"	11'-0"	8'-10"	3 3/4"	7 5/8"	8 7/8"
#11	15'-3"	13'-6"	10'-10"	4 1/4"	8 1/2"	9 7/8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
B - All bars not in Category A spaced less than 6" apart.  
C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. M(6.07)-81-127(L)	SHEET <u>2</u> OF <u>3</u>



BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-4"	3'-1"	2'-6"
#7	5'-9"	Does Not Exist	3'-4"
#8	7'-7"		4'-4"
#9	9'-7"		5'-6"
#10	12'-2"		7'-0"
#11	14'-11"		8'-7"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.  
 B - All bars not in Category A spaced less than 6" apart.  
 C - All bars not in Category A spaced 6" or more apart.

Note:

- When bar lap is not specified on the Plans, the above dimensions shall be used.
- These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
- These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.2 - For bars coated with epoxy not in Case No.1.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	-
1-22-01	-
9-20-05	-
11-26-07	-

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. M(6.07)-81-127(L)	SHEET <u>3</u> OF <u>3</u>



MISCELLANEOUS

## GENERAL NOTES

- Concrete: All concrete shall conform to Mix. No. 6 (4500 psi).
- Welded Steel Wire Fabric: All wire fabric shall be 6 x 6 - W2.9 x W2.9.
- Reinforcing Steel: Reinforcing steel shall conform to ASTM A 615 Grade 60.
- Structural Steel: All structural steel conform to ASTM A 709 Grade 36 or better.
- Anchor Bolts: All anchor bolts shall be ASTM A 325 unless otherwise specified on details.
- Connector Loop:  $\frac{3}{4}$ "  $\phi$  galvanized or stainless steel rod. Stainless steel rods shall conform to ASTM A 276 for the type specified, galvanizing shall conform to ASTM A 153.
- Connector Pin: The  $\frac{1}{4}$ " x 25" connector pin shall be a threaded rod or bolt conforming to ASTM A 307, Grade A. Nuts shall conform to ASTM A 563, Grade DH or DH3 or ASTM A 94, Grade 2H. Washers shall conform to ASTM F 436. The connector pin, nuts and washers shall be galvanized in conformance with ASTM A 153.
- Other Connector Devices: Contractor may use any other connection devices between barrier sections in lieu of the pin and loop, provided they appear on S.H.A. standard plates and have written approval of Chief Engineer.
- Temporary Shield: When specified on the Plans, a shield shall be connected to the temporary precast concrete barrier. The shield shall be designed, furnished, and installed by the Contractor. The height of the shield shall be 6 ft - 6 in. above the roadway surface, and shall have no cracks or openings through which material or debris can pass. The shield will not be measured but the cost will be incidental to the pertinent Temporary Concrete Traffic Barrier for Maintenance of Traffic item.

## METHODS OF ANCHORAGE CONNECTION TO CONCRETE DECKS

### EXISTING BRIDGE DECK TO BE REMOVED.

Holes for anchor bolts in existing bridge deck shall be drilled. Use  $\frac{1}{4}$ "  $\phi$  bolts with  $5\frac{1}{2}$ " x  $5\frac{1}{2}$ " x  $\frac{3}{4}$ " square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each  $\frac{1}{4}$ "  $\phi$  bolt at connection plate.

### EXISTING BRIDGE DECK TO REMAIN.

Holes for anchor bolts in existing bridge deck shall be cored. Use  $\frac{1}{4}$ "  $\phi$  bolts with  $5\frac{1}{2}$ " x  $5\frac{1}{2}$ " x  $\frac{3}{4}$ " square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each  $\frac{1}{4}$ "  $\phi$  bolt at connection plate. The Contractor is alerted that as little damage as possible shall be done to the existing reinforcement steel. Therefore, the Contractor shall locate the reinforcement steel and space the bolts to miss the reinforcement steel, all as directed by the Engineer. Fill all cored holes with epoxy grout after barrier is removed. (See below for grout composition).

### NEW BRIDGE DECK

$\frac{1}{4}$ "  $\phi$  bolt to be placed in an epoxy coated open coil anchor insert (cast in slab) having a minimum working load tension strength of 16 000 lb and shear strength of 13 000 lb with a minimum  $7\frac{1}{2}$ " length. Coil to be tapped for a  $\frac{1}{4}$ " N.C. thread bolt. No insert shall be longer than slab depth minus  $1\frac{1}{2}$ ". Provide Type 'A' plain washer SAE N (narrow) for each  $\frac{1}{4}$ "  $\phi$  bolt at connection plate. Fill all inserts with epoxy grout after barrier is removed. (See below for grout composition).

The Contractor may opt to utilize a  $\frac{1}{4}$ "  $\phi$  bolt placed in a  $1\frac{3}{8}$ "  $\phi$  drilled hole filled with high strength resin in lieu of the coil insert. The anchorage system shall meet the same strength properties as specified for the coil inserts verified by pullout tests monitored by the SHA's Office of Materials and Technology.

### GROUT COMPOSITION

Any areas of bridge decks, to remain in place, damaged as a result of anchoring temporary concrete barriers (anchor holes, etc.) shall be repaired to the satisfaction of the Engineer using an epoxy grout conforming to 902.11 (d).

APPROVAL	
<i>E.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 4/6/83	
REVISIONS	
SHA	FHWA
6-28-04	.
8-5-04	.
11-29-04	.
FHWA APPROVAL	
DATE: 6-8-90	5-19-09

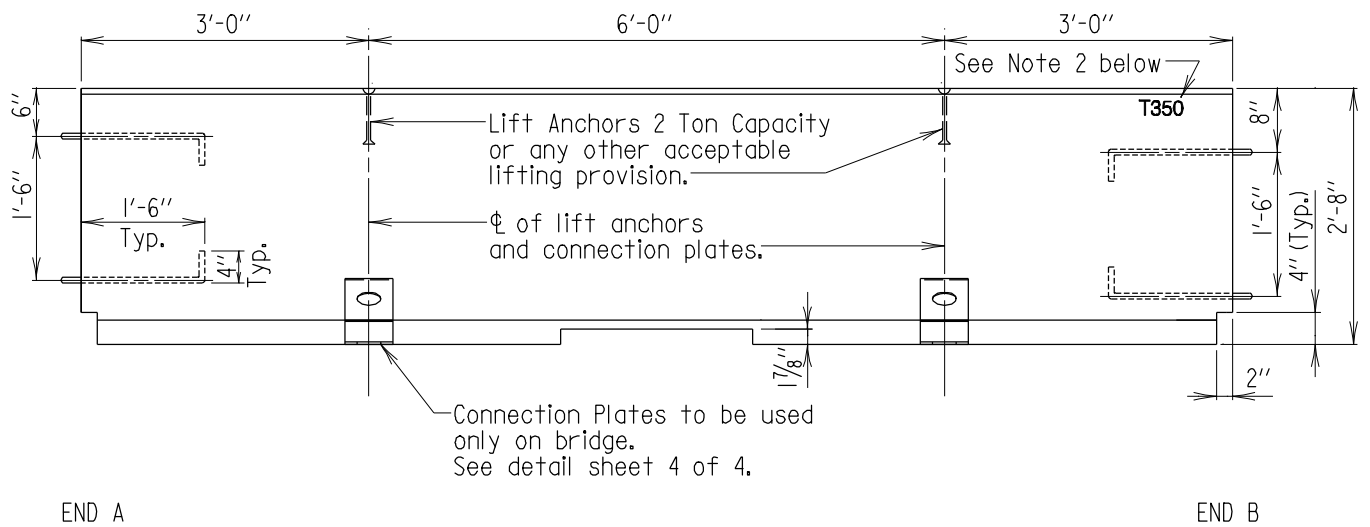
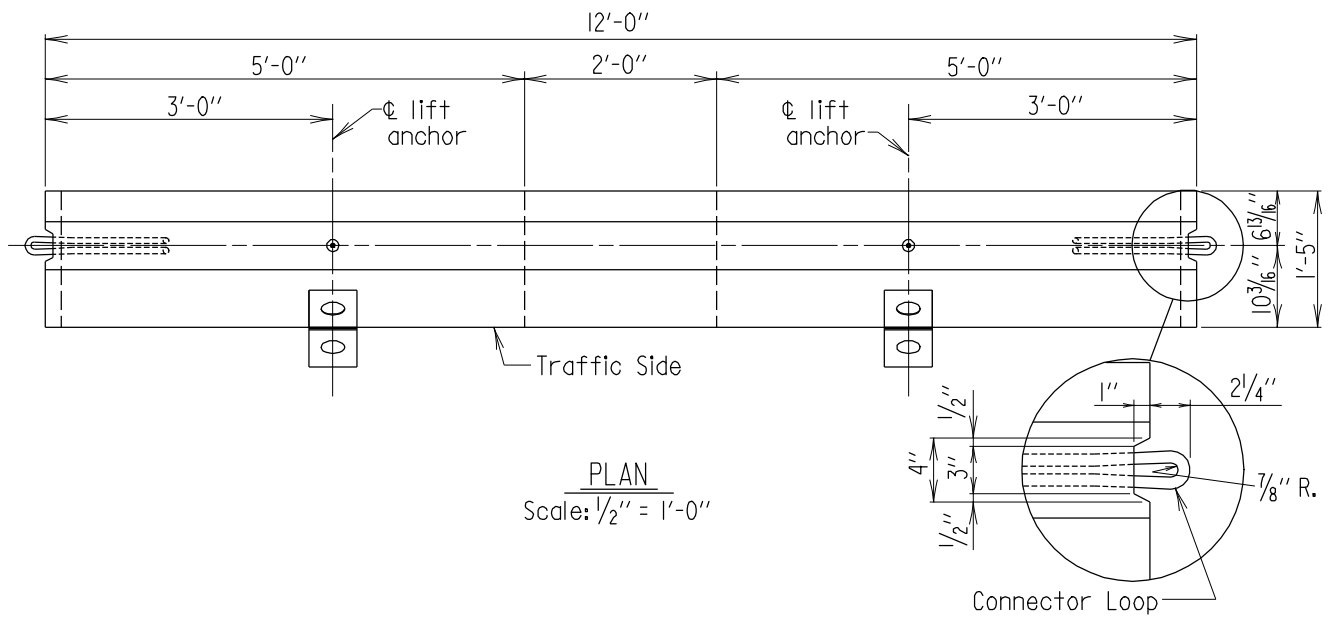
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TEMPORARY PRECAST SINGLE  
FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143

SHEET 1 OF 4

MISCELLANEOUS



#### Notes:

- One connector pin shall be furnished with each barrier. The cost of the connector pin shall be incidental to the item precast temporary concrete barrier.
- All barriers shall have "T350" imprinted on top end of barrier. Imprint shall have a minimum depth of  $\frac{1}{4}''$  and a minimum height of 2".

APPROVAL	
<i>L. S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/6/83	
REVISIONS	
SHA	FHWA
4-4-02	.
5-21-04	.
6-28-04	.
8-5-04	.

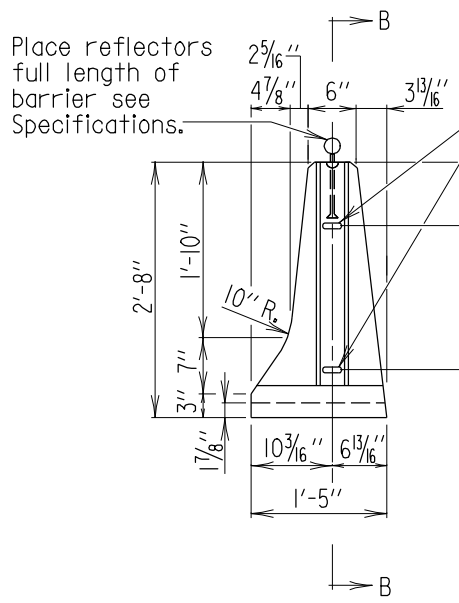
FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

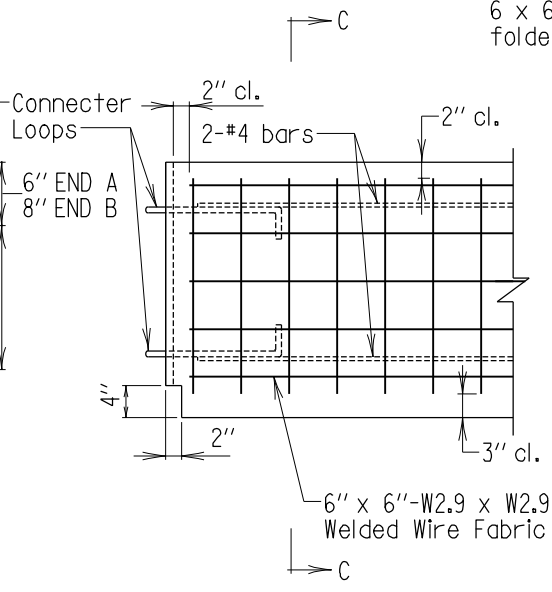
TEMPORARY PRECAST SINGLE  
FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143

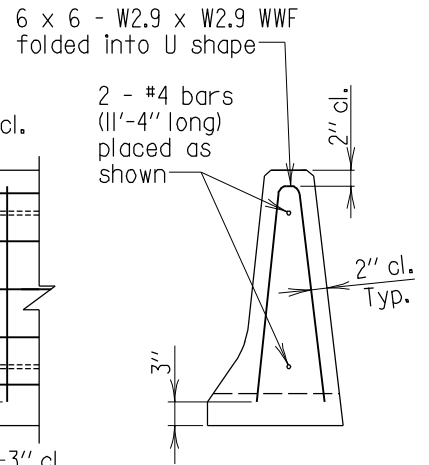
SHEET 2 OF 4



END VIEW  
Scale: 1/2" = 1'-0"

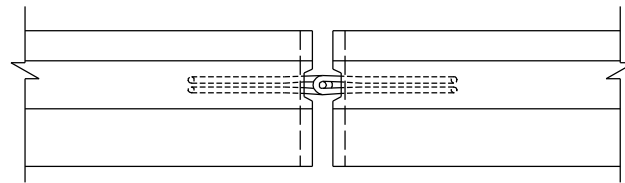


SECTION B-B

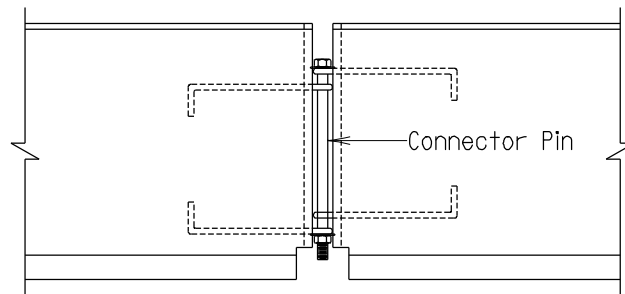


SECTION C-C

REINFORCING STEEL DETAILS  
Scale: 1/2" = 1'-0"



PLAN  
(Connector pin not shown)



ELEVATION  
JOINT DETAILS  
Scale: 1/2" = 1'-0"

APPROVAL	
<i>L. S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 4/6/83	
REVISIONS	
SHA	FHWA
4-4-02	.
5-21-04	.
6-28-04	.
8-5-04	.

FHWA APPROVAL  
DATE: 6-8-90

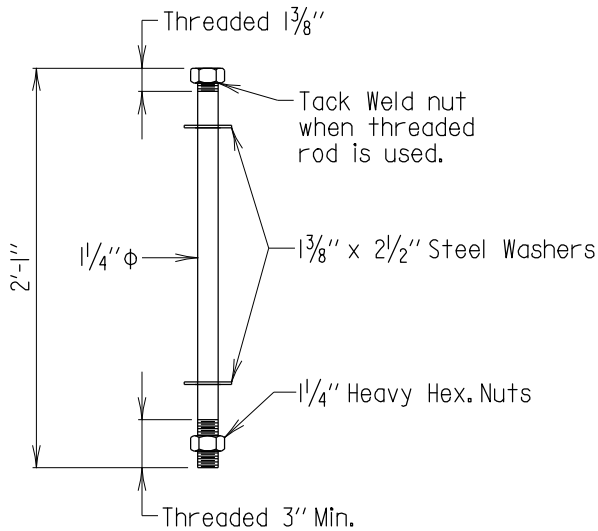
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TEMPORARY PRECAST SINGLE  
FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143

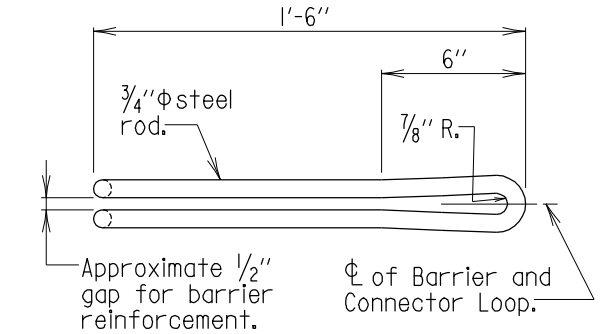
SHEET 3 OF 4

MISCELLANEOUS

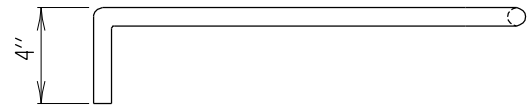


CONNECTOR PIN

Scale: None



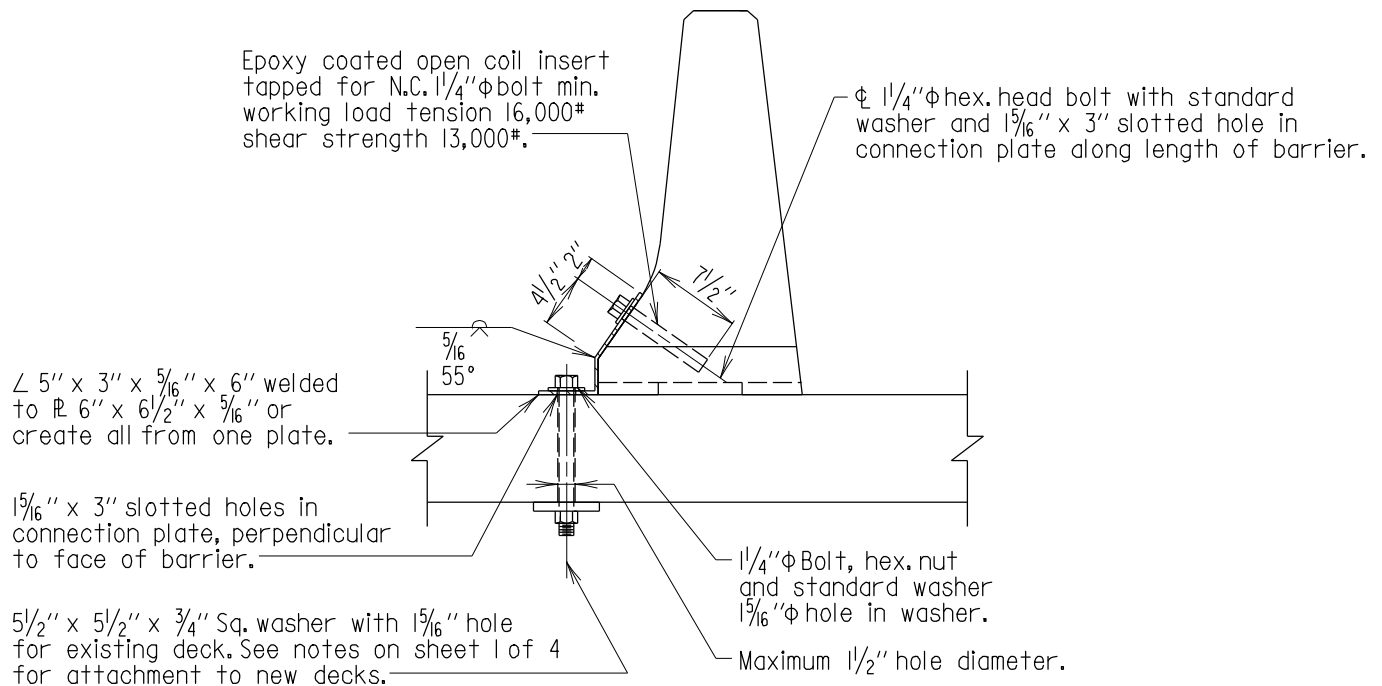
PLAN



ELEVATION

CONNECTOR LOOP

Scale: None



CONNECTION DETAIL

Scale: 3/4" = 1'-0"

APPROVAL	
<i>E.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 4/6/83	
REVISIONS	
SHA	FHWA
12-4-84	6-8-90
5-17-91	.
4-27-92	.
4-4-02	.

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TEMPORARY PRECAST SINGLE  
FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.09)-83-143

SHEET 4 OF 4

MISCELLANEOUS

Place minimum 9" wide steel wedges @ 3'-0" (±) c/c for entire span length; weld wedges (welds to be at least 3" long 1/4" welds) to each other and to beam to secure in place.

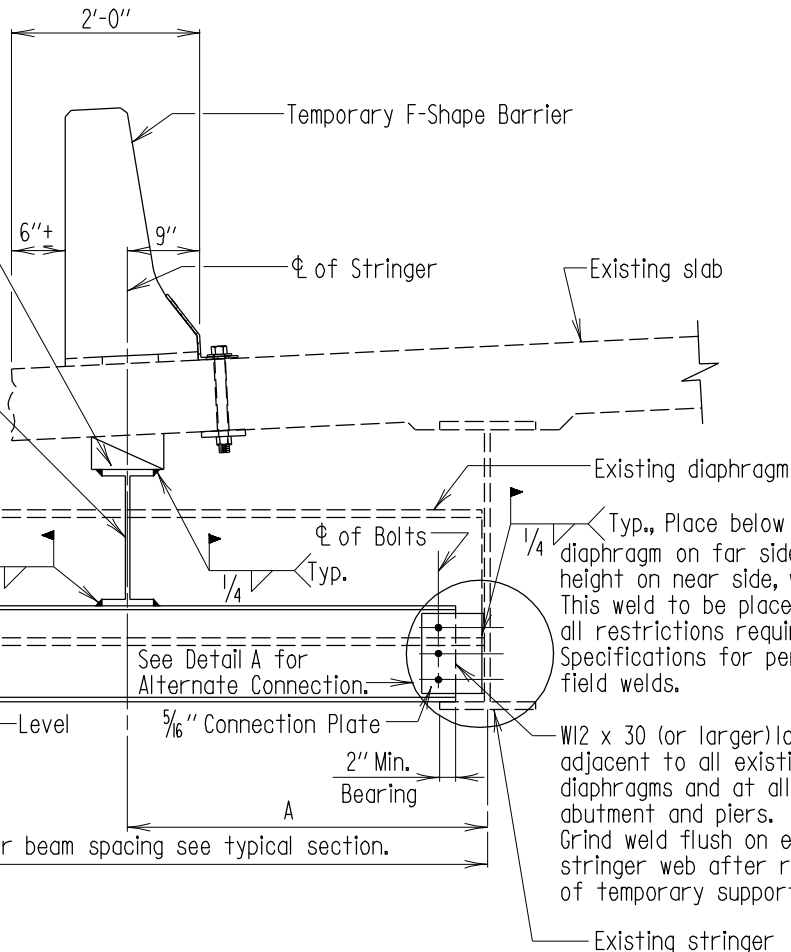
W14 x 61 (or larger) supported at each end adjacent to existing diaphragms.

Proposed slab

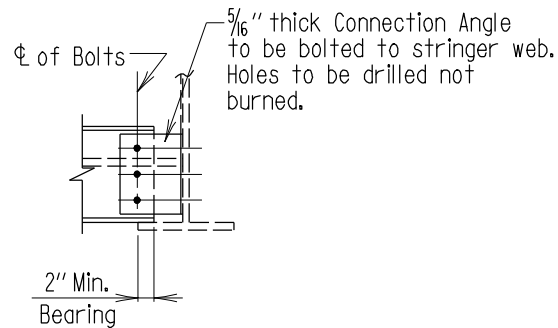
Place steel filler blocks (tack weld to W12 x 30 with at least 3" long 1/4" welds) at low stringer to make W12 x 30 horizontal. Do not weld to any part of stringer under any circumstances.

Existing stringer

Typ., Place below existing diaphragm on far side. Grind weld flush on existing stringer web after support removal.



SECTION  
Scale: 1/2" = 1'-0"



DETAIL 'A'  
Scale: 1/2" = 1'-0"

Notes:

- Existing structure shown in dashed lines.
- This detail is only required where A dimension is 2'-6" or greater.
- This detail can be used for maximum stringer spacing of 10' and maximum diaphragm spacing of 25'.
- All structural steel to be ASTM A 709 Grade 36 or better.
- All bolts to be 7/8" φ ASTM A-325 and holes to be 15/16" φ.
- Member sizes and connections shown are minimums. Engineer shall design.

APPROVAL	
<i>L. S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 9/2/83	
REVISIONS	
SHA	FHWA
9-24-96	.
1-22-01	.
FHWA APPROVAL	10-22-03
DATE: 10-7-83	10-9-07

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

DETAIL OF TEMPORARY SLAB  
UNDERPINNING DURING STAGE CONSTRUCTION

STANDARD NO. M(8.01)-83-153

SHEET 1 OF 1

MISCELLANEOUS

## GENERAL NOTES

- Concrete: All concrete shall conform to Mix. No. 6 (4500 psi).
- Welded Steel Wire Fabric: All wire fabric shall be 6 x 6 - W2.9 x W2.9.
- Reinforcing Steel: Reinforcing steel shall conform to ASTM A 615 Grade 60.
- Structural Steel: All structural steel conform to ASTM A 709 Grade 36 or better.
- Anchor Bolts: All anchor bolts shall be ASTM A 325 unless otherwise specified on details.
- Connector Loop:  $\frac{3}{4}$ "  $\phi$  galvanized or stainless steel rod. Stainless steel rods shall conform to ASTM A 276 for the type specified, galvanizing shall conform to ASTM A 153.
- Connector Pin: The  $\frac{1}{4}$ " x 25" connector pin shall be a threaded rod or bolt conforming to ASTM A 307, Grade A. Nuts shall conform to ASTM A 563, Grade DH or DH3 or ASTM A 94, Grade 2H. Washers shall conform to ASTM F 436. The connector pin, nuts and washers shall be galvanized in conformance with ASTM A 153.
- Other Connector Devices: Contractor may use any other connection devices between barrier sections in lieu of the pin and loop, provided they appear on S.H.A. standard plates and have written approval of Chief Engineer.
- Temporary Shield: When specified on the Plans, a shield shall be connected to the temporary precast concrete barrier. The shield shall be designed, furnished, and installed by the Contractor. The height of the shield shall be 6 ft - 6 in. above the roadway surface, and shall have no cracks or openings through which material or debris can pass. The shield will not be measured but the cost will be incidental to the pertinent Temporary Concrete Traffic Barrier for Maintenance of Traffic item.

## METHODS OF ANCHORAGE CONNECTION TO CONCRETE DECKS

### EXISTING BRIDGE DECK TO BE REMOVED.

Holes for anchor bolts in existing bridge deck shall be drilled. Use  $\frac{1}{4}$ "  $\phi$  bolts with  $5\frac{1}{2}$ " x  $5\frac{1}{2}$ " x  $\frac{3}{4}$ " square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each  $\frac{1}{4}$ "  $\phi$  bolt at connection plate.

### EXISTING BRIDGE DECK TO REMAIN.

Holes for anchor bolts in existing bridge deck shall be cored. Use  $\frac{1}{4}$ "  $\phi$  bolts with  $5\frac{1}{2}$ " x  $5\frac{1}{2}$ " x  $\frac{3}{4}$ " square washer under existing deck slab, as shown. Bolts shall be of sufficient length that when nut is tight, all the threads of the nut are engaged. Provide Type 'A' plain washer SAE N (narrow) for each  $\frac{1}{4}$ " bolt at connection plate. The Contractor is alerted that as little damage as possible shall be done to the existing reinforcement steel. Therefore, the Contractor shall locate the reinforcement steel and space the bolts to miss the reinforcement steel, all as directed by the Engineer. Fill all cored holes with epoxy grout after barrier is removed. (See below for grout composition).

### NEW BRIDGE DECK

$\frac{1}{4}$ "  $\phi$  bolt to be placed in an epoxy coated open coil anchor insert (cast in slab) having a minimum working load tension strength of 16 000 lb and shear strength of 13 000 lb with a minimum  $7\frac{1}{2}$ " length. Coil to be tapped for a  $\frac{1}{4}$ " N.C. thread bolt. No insert shall be longer than slab depth minus 1". Provide Type 'A' plain washer SAE N (narrow) for each  $\frac{1}{4}$ "  $\phi$  bolt at connection plate. Fill all inserts with epoxy grout after barrier is removed. (See below for grout composition).

The Contractor may opt to utilize a  $\frac{1}{4}$ "  $\phi$  bolt placed in a  $1\frac{3}{8}$ "  $\phi$  drilled hole filled with high strength resin in lieu of the coil insert. The anchorage system shall meet the same strength properties as specified for the coil inserts verified by pullout tests monitored by the SHA's Office of Materials and Technology.

### GROUT COMPOSITION

Any areas of bridge decks, to remain in place, damaged as a result of anchoring temporary concrete barriers (anchor holes, etc.) shall be repaired to the satisfaction of the Engineer using an epoxy grout conforming to 902.11 (d).

### Note:

The Contractor has the option of using either Jersey barrier or Type F barrier made prior to May 1, 2004 or this Type F barrier for temporary barrier until July 1, 2006, so long as only one type of barrier is used on this project.

APPROVAL	
<i>L. S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 6/15/84	
REVISIONS	
SHA	FHWA
5-21-04	.
6-28-04	.
8-5-04	.
11-29-04	.

FHWA APPROVAL  
DATE: 1-23-85

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

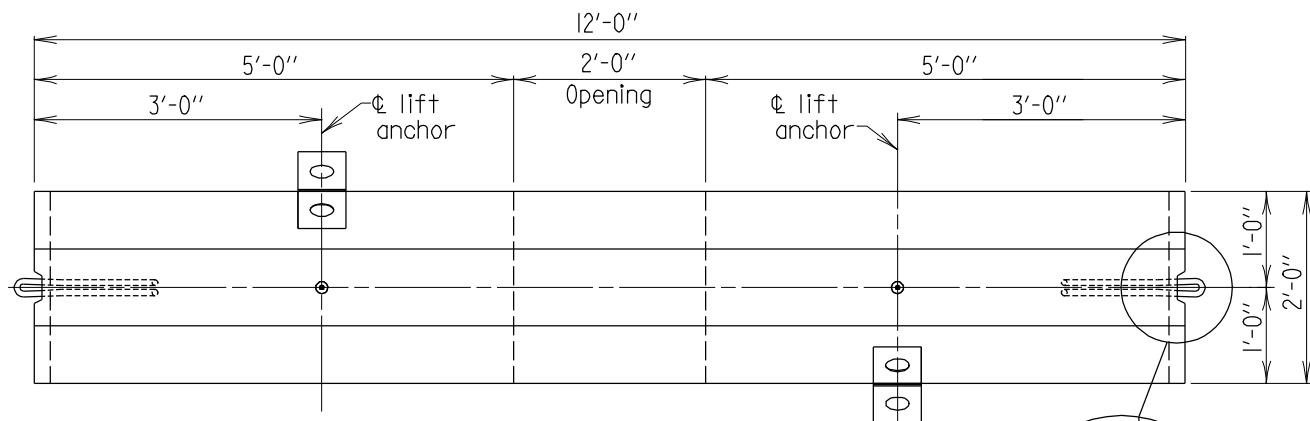
TEMPORARY PRECAST DOUBLE  
FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.10)-84-158

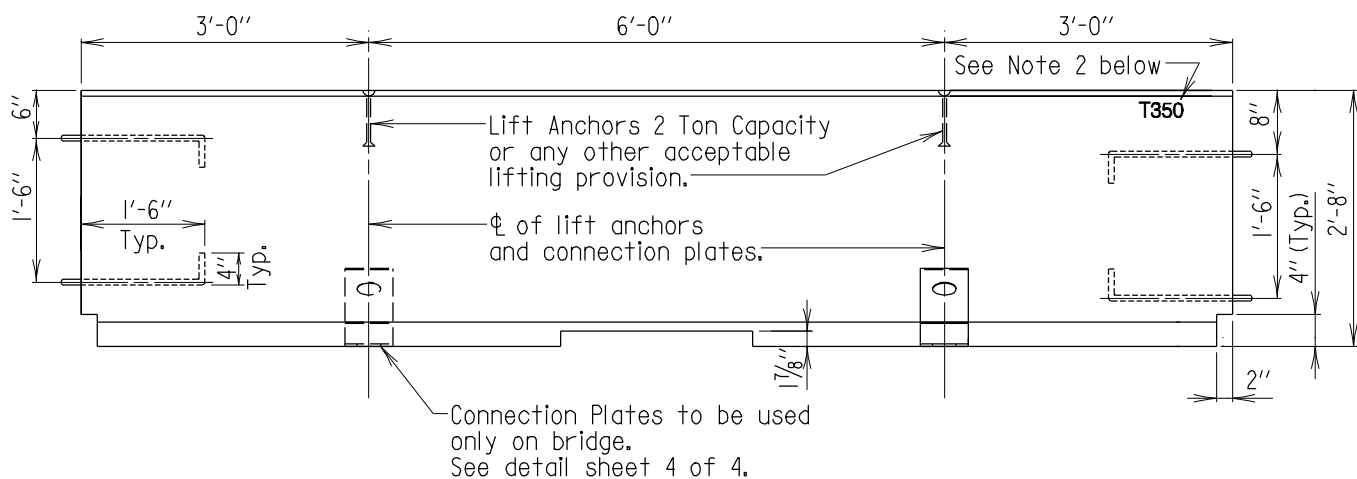
SHEET 1 OF 4

MISCELLANEOUS





PLAN  
Scale:  $\frac{1}{2}'' = 1'-0''$



END A

END B

ELEVATION  
Scale:  $\frac{1}{2}'' = 1'-0''$

Notes:

- One connector pin shall be furnished with each barrier. The cost of the connector pin shall be incidental to the item precast temporary concrete barrier.
- All barriers shall have "T350" imprinted on top end of barrier. Imprint shall have a minimum depth of  $\frac{1}{4}''$  and a minimum height of 2".

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 6/15/84	
REVISIONS	
SHA	FHWA
4-4-02	.
5-21-04	.
6-28-04	.
8-5-04	.

FHWA APPROVAL  
DATE: 1-23-85

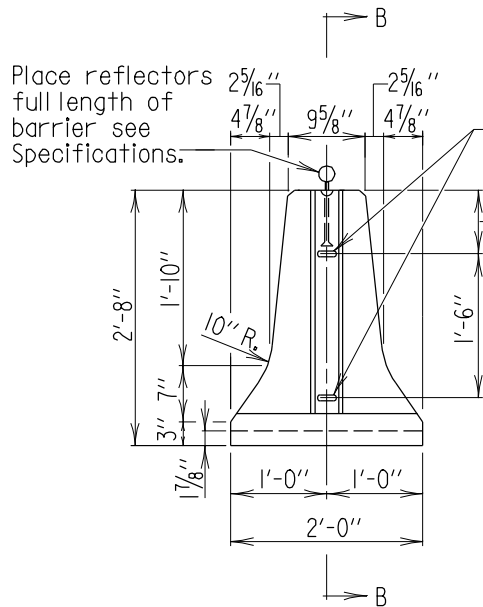
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TEMPORARY PRECAST DOUBLE  
FACE F-TYPE CONCRETE BARRIER

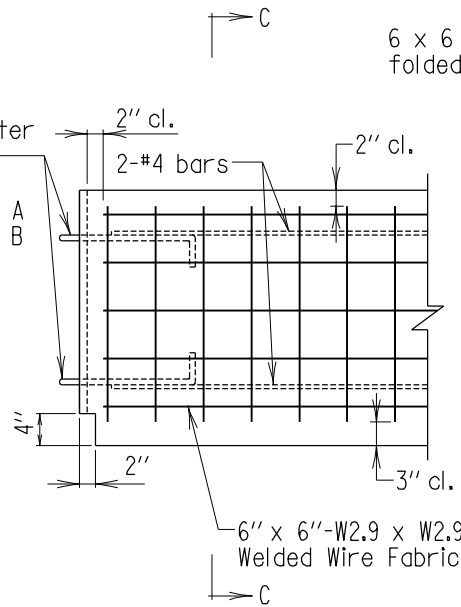
STANDARD NO. M(5.10)-84-158

SHEET 2 OF 4

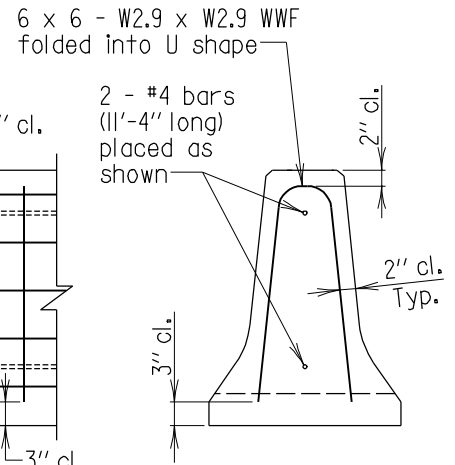
MISCELLANEOUS



END VIEW  
Scale:  $\frac{1}{2}'' = 1'-0''$

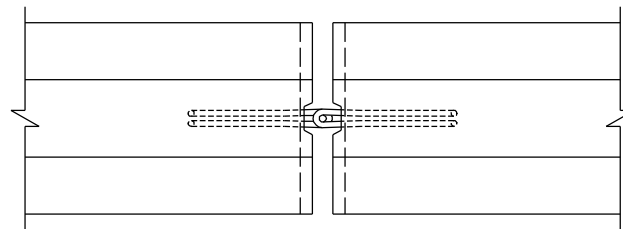


SECTION B-B

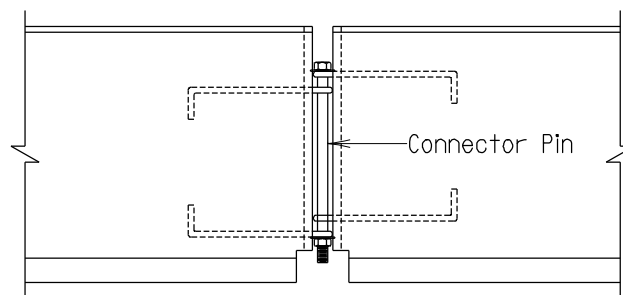


SECTION C-C

REINFORCING STEEL DETAILS  
Scale:  $\frac{1}{2}'' = 1'-0''$



PLAN  
(Connector pin not shown)



ELEVATION  
JOINT DETAILS  
Scale:  $\frac{1}{2}'' = 1'-0''$

APPROVAL	
<i>L. S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 6/15/84	
REVISIONS	
SHA	FHWA
4-4-02	.
5-21-04	.
6-28-04	.
FHWA APPROVAL	8-5-04
DATE: 1-23-85	.

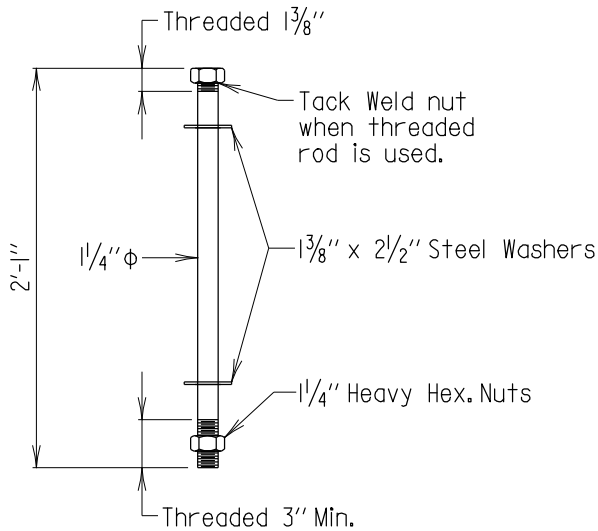
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TEMPORARY PRECAST DOUBLE  
FACE F-TYPE CONCRETE BARRIER

STANDARD NO. M(5.10)-84-158

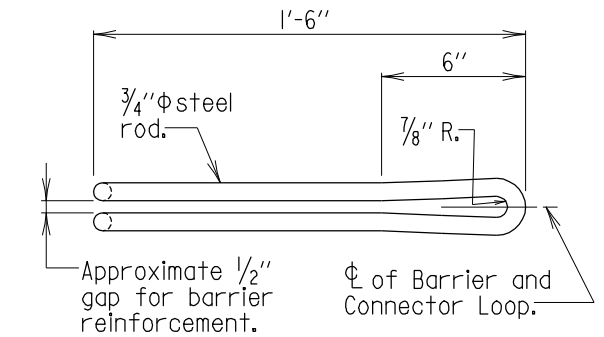
SHEET 3 OF 4

MISCELLANEOUS

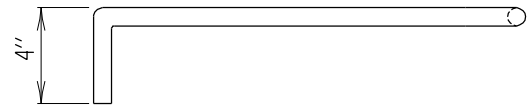


CONNECTOR PIN

Scale: None



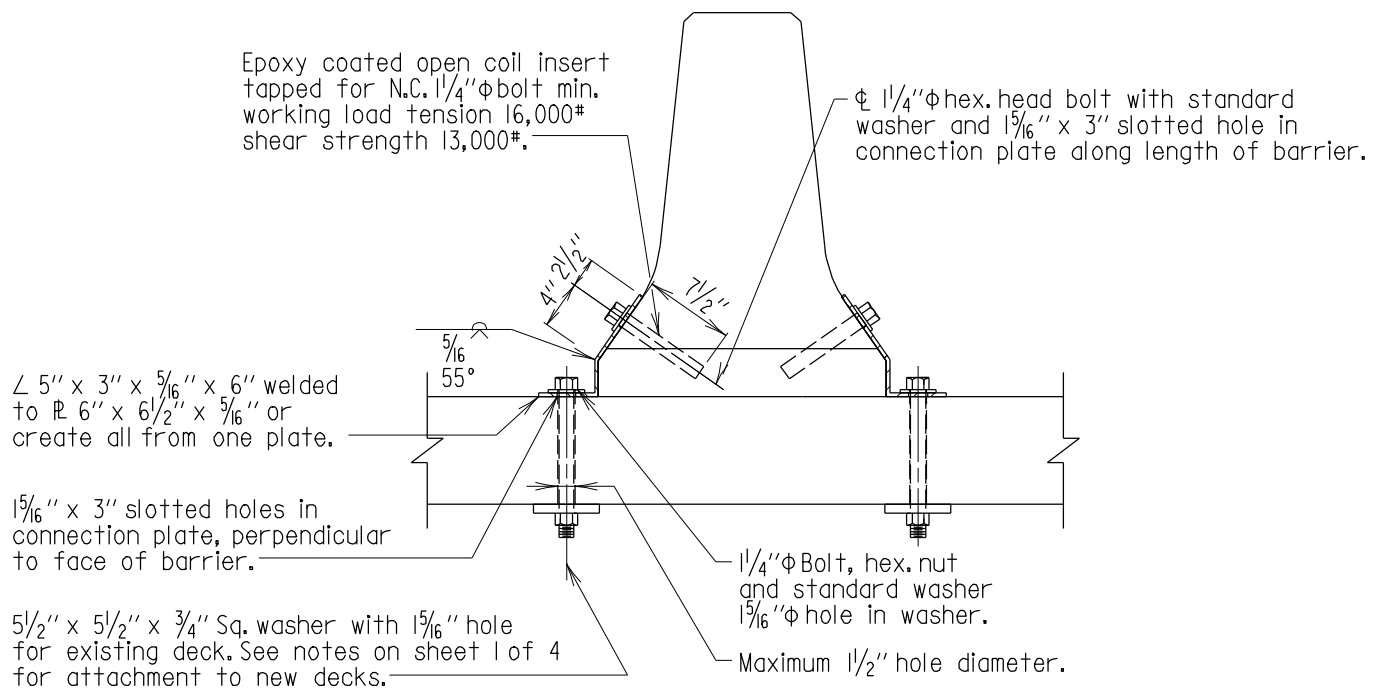
PLAN



ELEVATION

CONNECTOR LOOP

Scale: None



CONNECTION DETAIL

Scale:  $\frac{3}{4}" = 1'-0"$

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 6/15/84	
REVISIONS	
SHA	FHWA
12-4-84	1-23-85
5-17-91	.
4-27-92	.
4-4-02	.

FHWA APPROVAL
DATE: 1-23-85

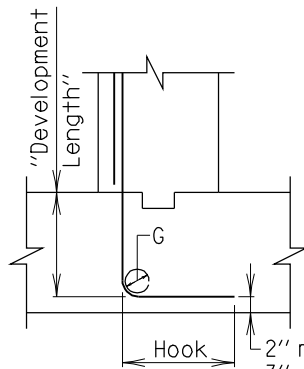
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TEMPORARY PRECAST DOUBLE  
FACE F-TYPE CONCRETE BARRIER

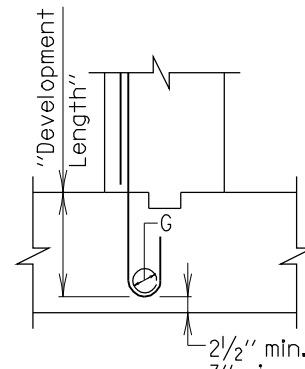
STANDARD NO. M(5.10)-84-158

SHEET 4 OF 4

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	8"	11"	9"
#5	9"	1'-1"	11"
#6	11"	1'-4"	1'-1"
#7	1'-1"	1'-6"	1'-3"
#8	1'-3"	1'-9"	1'-5"
#9	1'-5"	1'-11"	1'-7"
#10	1'-7"	2'-2"	1'-9"
#11	1'-9"	2'-5"	1'-11"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3 3/4"	7"	10"
#6	4 1/2"	8"	1'-0"
#7	5 1/4"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9 1/2"	1'-3"	1'-7"
#10	10 3/4"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.14)-90-214; then hook shall be added to all bars not conforming, as per D, E & F.

APPROVAL	
<i>E. S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/4/86	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

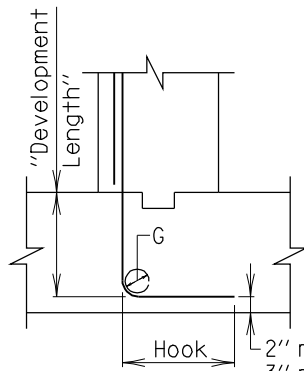
FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED  
BARS FOR GRADE 60 REINFORCING STEEL  
IN MIX NO. 3 (3500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

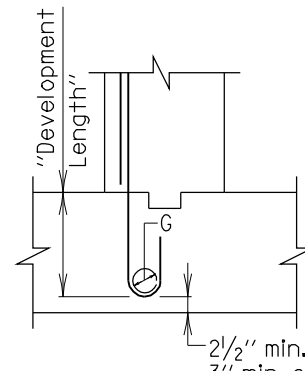
STANDARD NO. M(6.08)-86-178

SHEET 1 OF 1

MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	8"	11"	9"
#5	9"	1'-1"	11"
#6	11"	1'-4"	1'-1"
#7	1'-1"	1'-6"	1'-3"
#8	1'-3"	1'-9"	1'-5"
#9	1'-5"	1'-11"	1'-7"
#10	1'-7"	2'-2"	1'-9"
#11	1'-9"	2'-5"	1'-11"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3 3/4"	7"	10"
#6	4 1/2"	8"	1'-0"
#7	5 1/4"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9 1/2"	1'-3"	1'-7"
#10	10 3/4"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.14)-90-214; then hook shall be added to all bars not conforming, as per D, E & F.

APPROVAL	
<i>E. S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/4/86	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

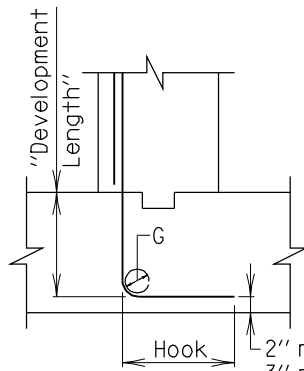
FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED  
BARS FOR GRADE 60 REINFORCING STEEL  
IN MIX NO. 3 (3500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

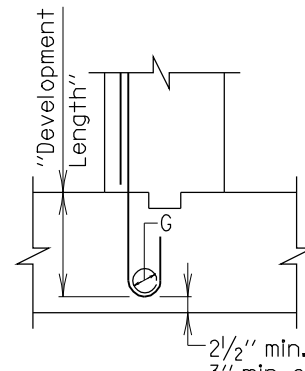


STANDARD NO. M(6.08)-86-178(L)

SHEET 1 OF 1



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	9"	1'-0"	10"
#5	11"	1'-3"	1'-0"
#6	1'-1"	1'-6"	1'-2"
#7	1'-3"	1'-9"	1'-5"
#8	1'-5"	2'-0"	1'-7"
#9	1'-7"	2'-3"	1'-10"
#10	1'-9"	2'-6"	2'-0"
#11	1'-11"	2'-9"	2'-3"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3 3/4"	7"	10"
#6	4 1/2"	8"	1'-0"
#7	5 1/4"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9 1/2"	1'-3"	1'-7"
#10	10 3/4"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths only apply to 4500 P.S.I. lightweight concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.15)-90-215; then hook shall be added to all bars not conforming, as per D, E & F.

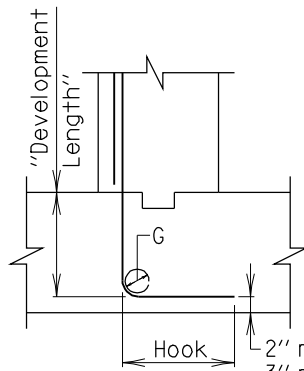
APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/4/86	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: 6-8-90

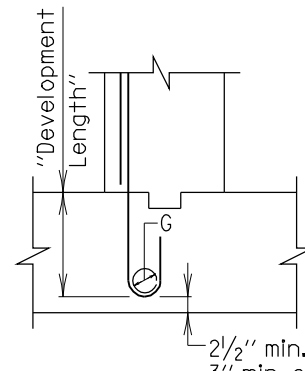
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED  
BARS FOR GRADE 60 REINFORCING STEEL  
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.09)-86-179

SHEET 1 OF 1



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	9"	1'-0"	10"
#5	11"	1'-3"	1'-0"
#6	1'-1"	1'-6"	1'-2"
#7	1'-3"	1'-9"	1'-5"
#8	1'-5"	2'-0"	1'-7"
#9	1'-7"	2'-3"	1'-10"
#10	1'-9"	2'-6"	2'-0"
#11	1'-11"	2'-9"	2'-3"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3 3/4"	7"	10"
#6	4 1/2"	8"	1'-0"
#7	5 1/4"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9 1/2"	1'-3"	1'-7"
#10	10 3/4"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths only apply to 4500 P.S.I. lightweight concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.15)-90-215; then hook shall be added to all bars not conforming, as per D, E & F.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/4/86	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE: 6-8-90

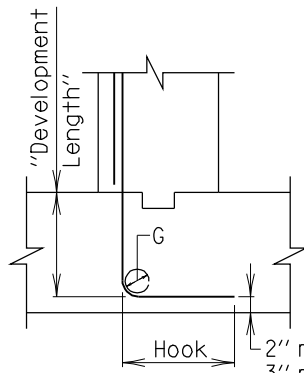
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED  
BARS FOR GRADE 60 REINFORCING STEEL  
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.09)-86-179(L)

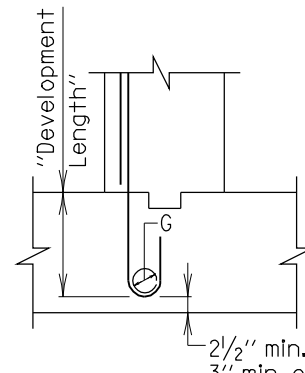
SHEET 1 OF 1



MISCELLANEOUS



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	7"	9"	8"
#5	8"	1'-0"	9"
#6	10"	1'-2"	11"
#7	11"	1'-4"	1'-1"
#8	1'-1"	1'-6"	1'-3"
#9	1'-3"	1'-9"	1'-5"
#10	1'-4"	1'-11"	1'-7"
#11	1'-6"	2'-2"	1'-9"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3 3/4"	7"	10"
#6	4 1/2"	8"	1'-0"
#7	5 1/4"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9 1/2"	1'-3"	1'-7"
#10	10 3/4"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.16)-90-216; then hook shall be added to all bars not conforming, as per D, E & F.

APPROVAL	
<i>E.S. Faden</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/4/86	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: 6-8-90

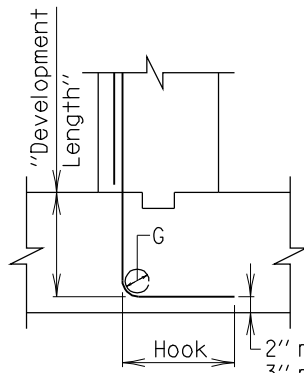
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED  
BARS FOR GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.10)-86-180

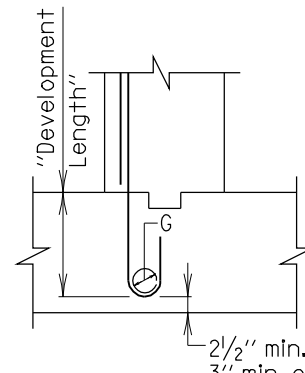
SHEET 1 OF 1

MISCELLANEOUS





STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	7"	9"	8"
#5	8"	1'-0"	9"
#6	10"	1'-2"	11"
#7	11"	1'-4"	1'-1"
#8	1'-1"	1'-6"	1'-3"
#9	1'-3"	1'-9"	1'-5"
#10	1'-4"	1'-11"	1'-7"
#11	1'-6"	2'-2"	1'-9"

RECOMMENDED END HOOKS ALL GRADES			
BAR SIZE	Finished bend diameter G in.	180 Degree hooks	90 Degree hooks
#4	3"	6"	8"
#5	3 3/4"	7"	10"
#6	4 1/2"	8"	1'-0"
#7	5 1/4"	10"	1'-2"
#8	6"	11"	1'-4"
#9	9 1/2"	1'-3"	1'-7"
#10	10 3/4"	1'-5"	1'-10"
#11	1'-0"	1'-7"	2'-0"

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. M(6.16)-90-216; then hook shall be added to all bars not conforming, as per D, E & F.

APPROVAL	
<i>E.S. Fadden</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 4/4/86	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE: 6-8-90

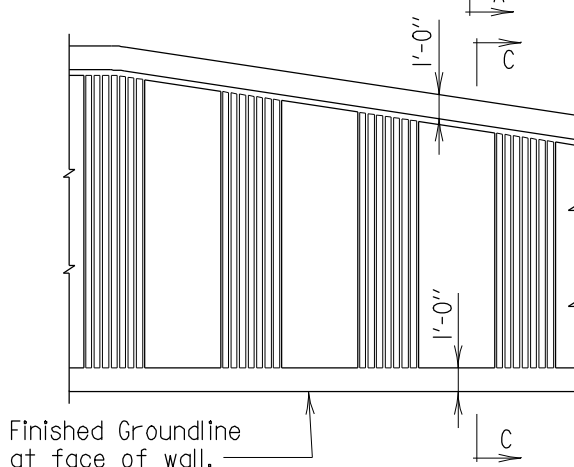
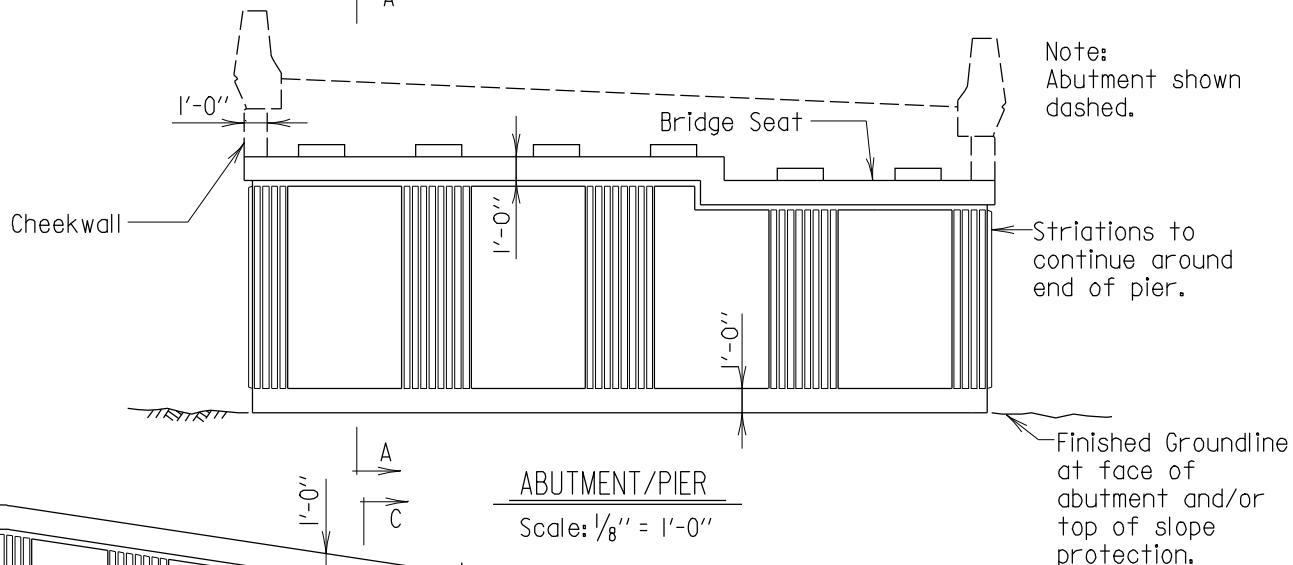
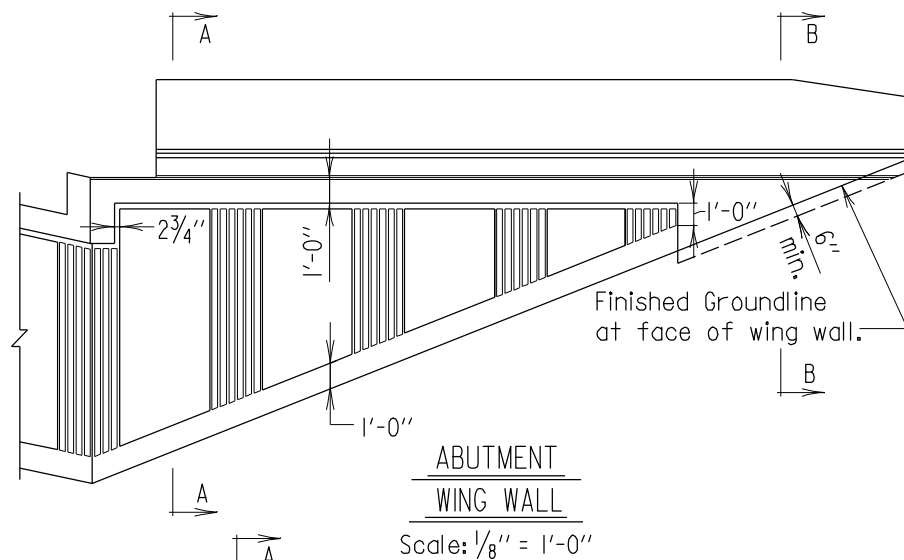
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED  
BARS FOR GRADE 60 REINFORCING STEEL  
IN MIX NO. 6 (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.10)-86-180(L)

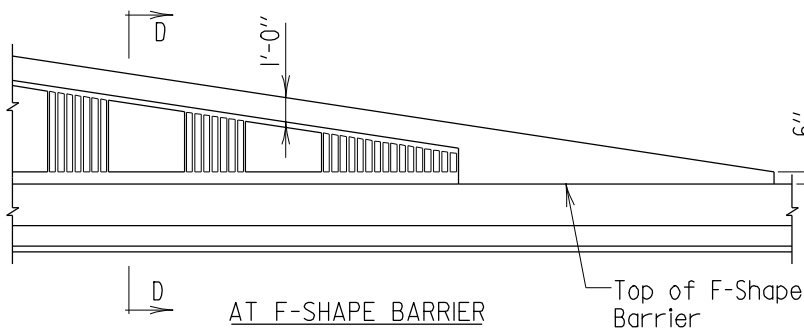
SHEET 1 OF 1



MISCELLANEOUS



AT OTHER LOCATIONS



#### Notes:

1. Special layouts may be necessary at certain locations. If details are shown on other Contract Drawings such limitations will take priority over these standards.
2. These striations shall only be used on bridge substructure elements and retaining walls, where specifically called for on Contract Drawings.
3. Cost of all striations, complete-in-place, to be included in other pertinent Contract items.
4. Contraction and expansion joints shall always be located in striated areas.

FHWA APPROVAL  
DATE: 6-8-90

APPROVAL	
<i>L.S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 11/3/86	
REVISIONS	
SHA	FHWA
1-22-01	
10-22-03	

#### RETAINING WALL

Scale:  $\frac{1}{8}" = 1'-0"$

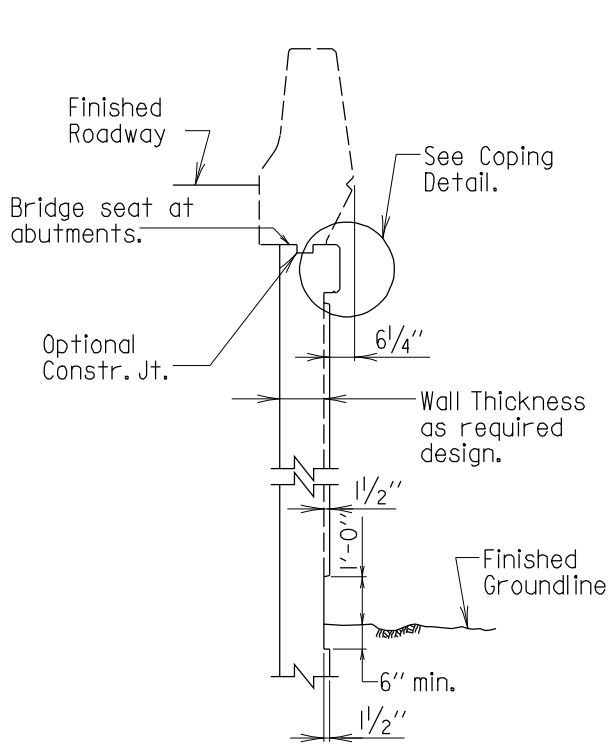
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

TRAPEZOIDAL STRIATION DETAILS FOR  
BRIDGE SUBSTRUCTURE UNITS  
AND RETAINING WALLS

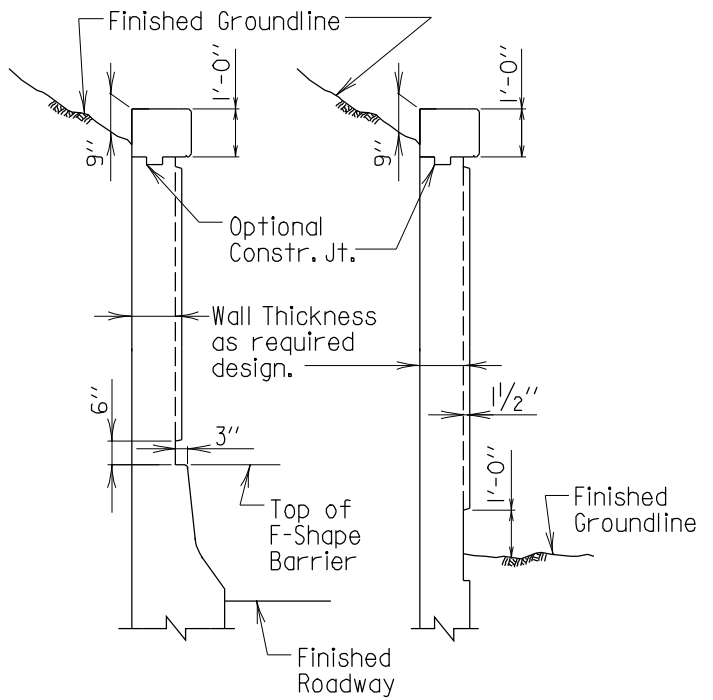
STANDARD NO. M(6.11)-86-181

SHEET 1 OF 2

MISCELLANEOUS

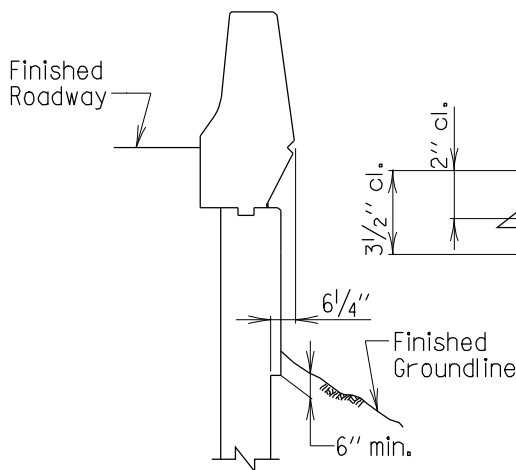


SECTION A-A  
Scale: 1/4" = 1'-0"

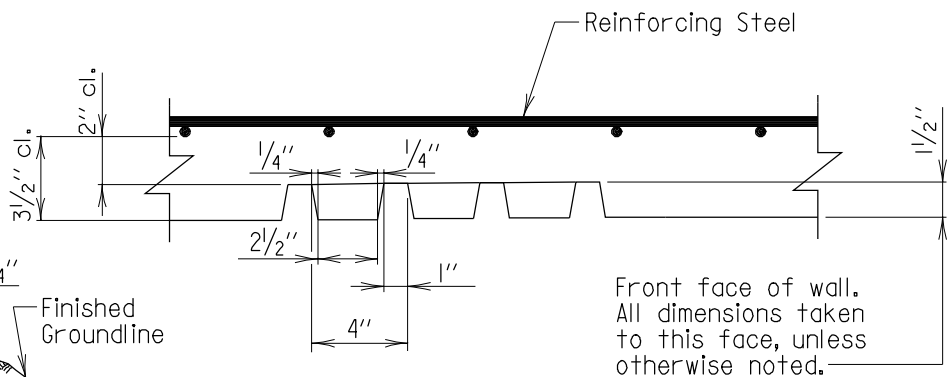


SECTION D-D  
RETAINING WALL  
WITH JERSEY BARRIER  
Scale: 1/4" = 1'-0"

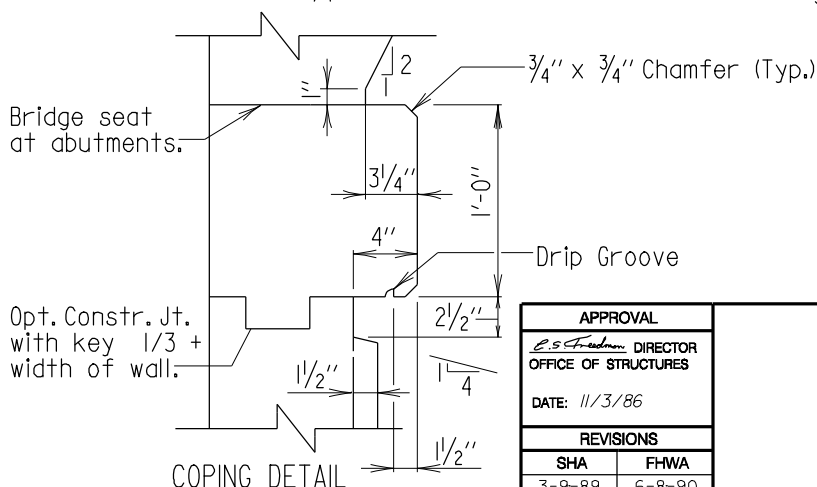
SECTION C-C  
RETAINING WALL  
AT OTHER LOCATIONS  
Scale: 1/4" = 1'-0"



SECTION B-B  
Scale: 1/4" = 1'-0"



FORMBOARD PATTERN DETAIL  
Scale: 1 1/2" = 1'-0"



COPING DETAIL  
Scale: 1" = 1'-0"

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REVISIONS	
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1-22-01	.
10-22-03	.
FHWA APPROVAL	
DATE: 6-8-90	

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
TRAPEZOIDAL STRIATION DETAILS FOR  
BRIDGE SUBSTRUCTURE UNITS  
AND RETAINING WALLS

STANDARD NO. M(6.11)-86-181

SHEET 2 OF 2

MISCELLANEOUS

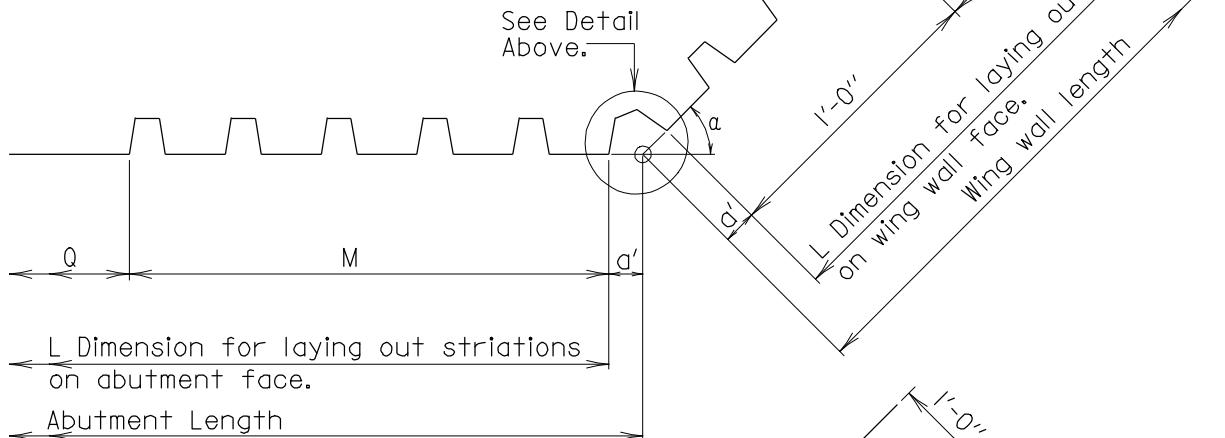
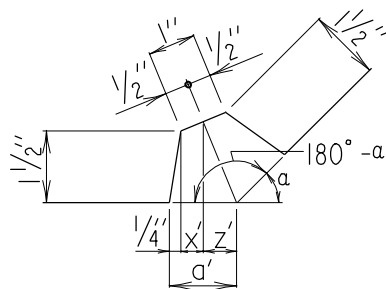
$$a' = x' + z' + \frac{1}{4}''$$

$$x' = \frac{1}{2}'' \cos a/2$$

$$y' = \frac{1}{2}'' \sin a/2$$

$$z' = (\frac{1}{2}'' + y') \tan a/2$$

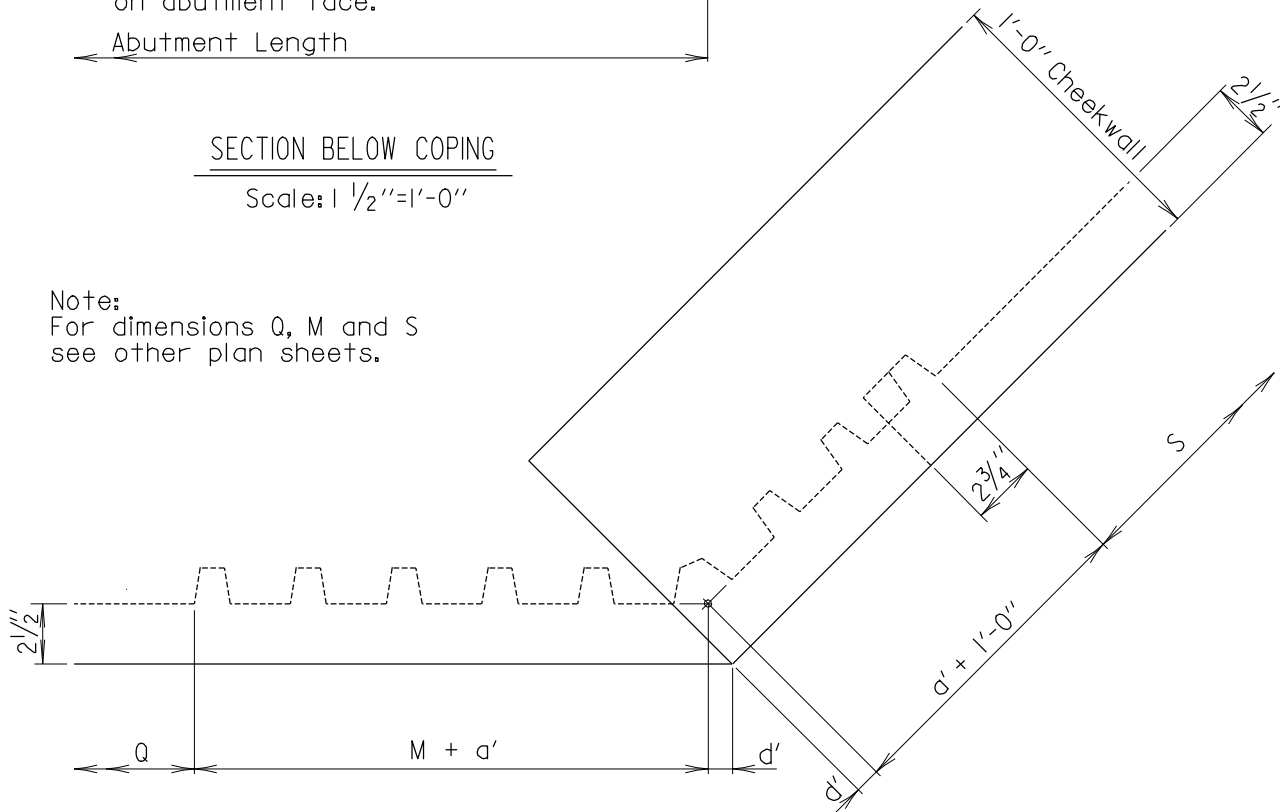
$$d' = 2 \frac{1}{2}'' \tan a/2$$



#### SECTION BELOW COPING

Scale:  $1 \frac{1}{2}'' = 1'-0''$

Note:  
For dimensions Q, M and S  
see other plan sheets.



#### SECTION THRU COPING

Scale:  $1 \frac{1}{2}'' = 1'-0''$

Location				
a'				
d'				

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5-12-89	6-8-90
1-22-01	

FHWA APPROVAL
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

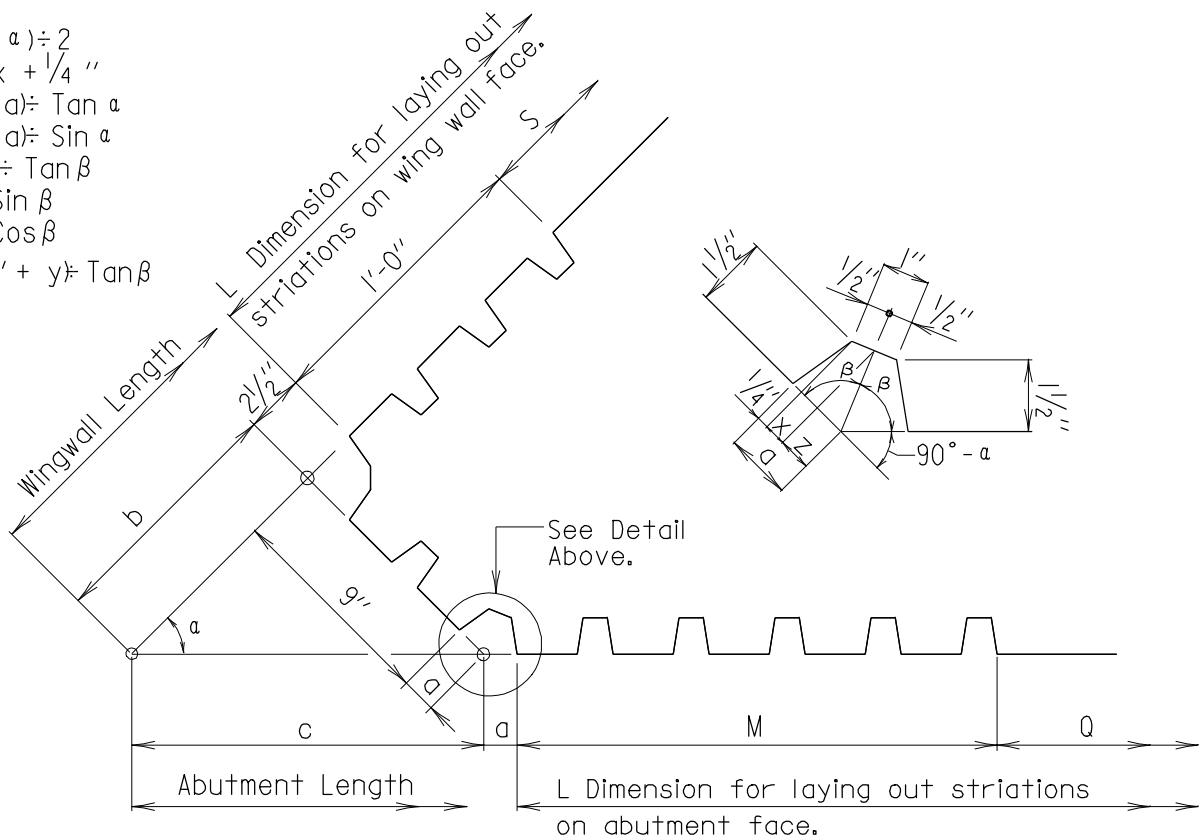
TRAPEZOIDAL STRIATION CORNER DETAILS  
SQUARE AND OBTUSE CORNER

STANDARD NO. M(6.12)-86-182

SHEET 1 OF 2

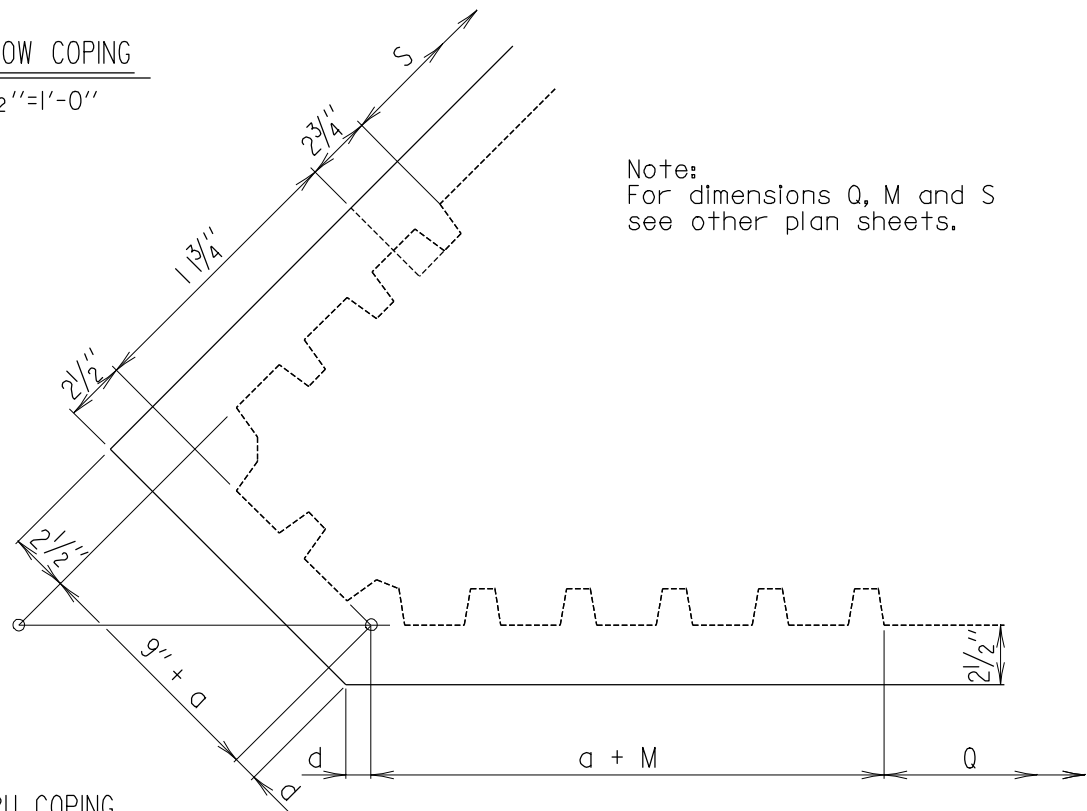
MISCELLANEOUS

$$\begin{aligned}\beta &= (90 + a) \div 2 \\ a &= z + x + \frac{1}{4}'' \\ b &= (9'' + a) \div \tan a \\ c &= (9'' + a) \div \sin a \\ d &= 2\frac{1}{2}'' \div \tan \beta \\ x &= \frac{1}{2}'' \sin \beta \\ y &= \frac{1}{2}'' \cos \beta \\ z &= (1\frac{1}{2}'' + y) \div \tan \beta\end{aligned}$$



### SECTION BELOW COPING

Scale:  $1\frac{1}{2}''=1'-0''$



### SECTION THRU COPING

Scale:  $1\frac{1}{2}''=1'-0''$

Location				
a				
b				
c				
d				

APPROVAL	
<i>CS Fisher</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 11-3-86	
REVISIONS	
SHA	FHWA
10-14-87	6-8-90
1-22-01	

FHWA APPROVAL  
DATE: 6-8-90

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

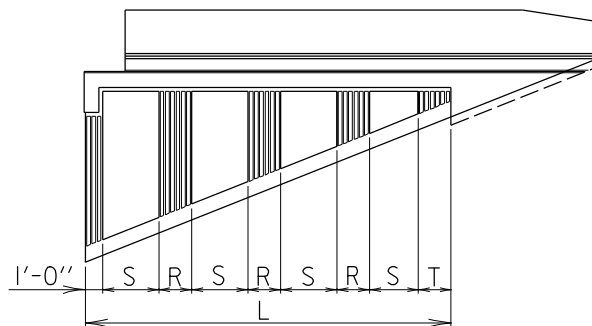
TRAPEZOIDAL STRIATION CORNER DETAILS  
ACUTE CORNER

STANDARD NO. M(6.12)-86-182

SHEET 2 OF 2

MISCELLANEOUS

For wing walls  
 $S \approx \frac{4}{3}T \approx 2R$



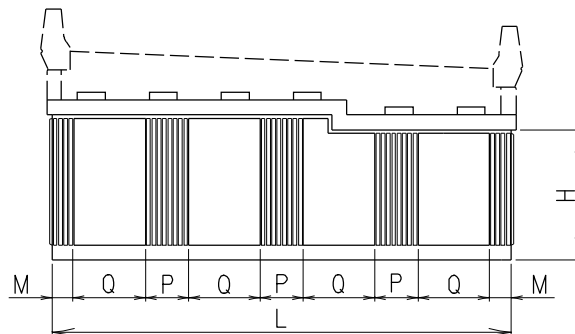
$S = 1/N (L - 1' - 0'' - T - (N - 1)R)$   
 N=Number of Plain Panels  
 R=Intermediate Striated Panel Dimension  
 T=End Striated Panel Dimension  
 S=Plain Panel Length  
 L=Adjusted Length of Abutment Face (See M(6.12)-86-182)

ABUTMENT

WING WALL

Scale:None

For abutments/piers  
 $Q \approx 2P \approx 4M$

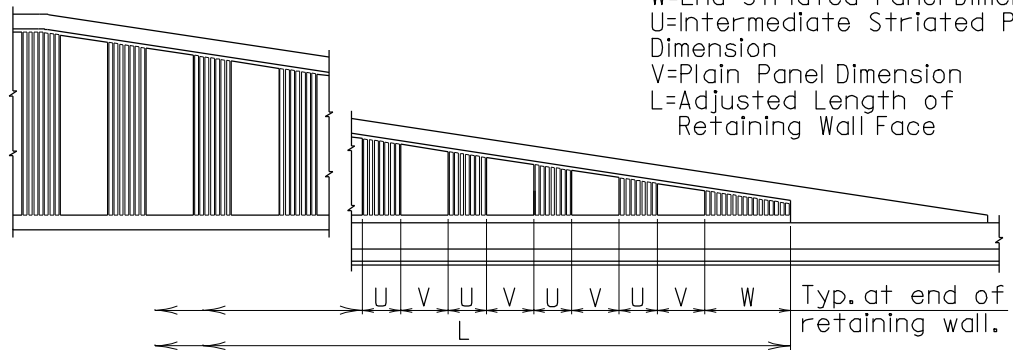


$Q = 1/N (L - 2M - (N - 1)P)$   
 N=Number of Plain Panels  
 M=End Striated Panel Dimension  
 P=Intermediate Striated Panel Dimension  
 Q=Plain Panel Dimension  
 L=Adjusted Length of Abutment Face (See M(6.12)-86-182)

ABUTMENT/PIER

Scale:None

For retaining walls  
 $W \approx \frac{5}{4}V \approx \frac{5}{3}U$



$V = 1/N (L - 2W - (N - 1)U)$   
 N=Number of Plain Panels  
 W=End Striated Panel Dimension  
 U=Intermediate Striated Panel Dimension  
 V=Plain Panel Dimension  
 L=Adjusted Length of Retaining Wall Face

RETAINING WALL

Scale:None

FOR OFFICE USE ONLY

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<i>E. S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 12/24/86	
REVISIONS	
SHA	FHWA
12-21-87	.
10-22-03	.
FHWA APPROVAL	.
DATE:	.

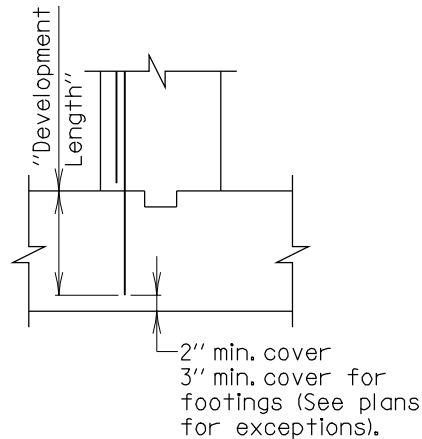
STATE OF MARYLAND  
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 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES

TRAPEZOIDAL STRIATION DETAILS FOR  
 BRIDGE SUBSTRUCTURE UNITS  
 AND RETAINING WALLS

STANDARD NO. M(6.13)-86-183

SHEET 1 OF 1

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-1"	2'-1"	1'-8"
#8	3'-9"	2'-9"	2'-2"
#9	4'-9"	3'-5"	2'-9"
#10	6'-1"	4'-4"	3'-6"
#11	7'-5"	5'-4"	4'-3"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."
- If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.08)-86-178.

APPROVAL	
<i>E. S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
1-22-01	
9-20-05	
12-4-07	

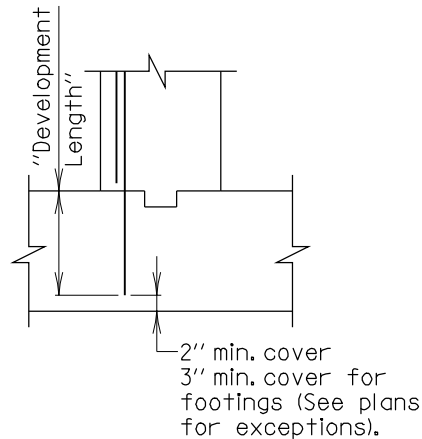
FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.14)-90-214

SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-6"	3'-1"	2'-6"	2 5/8"	5 1/4"	6 1/8"
#8	4'-7"	4'-1"	3'-3"	3"	6"	7"
#9	5'-9"	5'-1"	4'-1"	3 3/8"	6 3/4"	7 7/8"
#10	7'-4"	6'-6"	5'-2"	3 3/4"	7 5/8"	8 1/8"
#11	9'-0"	7'-11"	6'-4"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.

2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.

3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
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11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: .

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

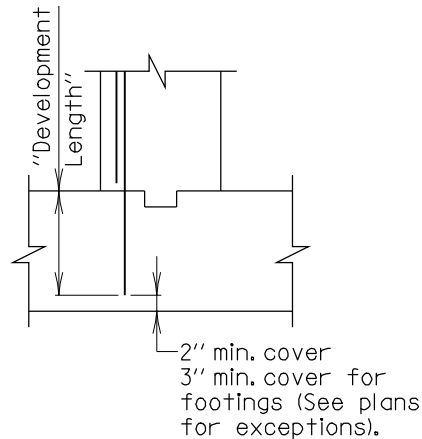
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.14)-90-214

SHEET 2 OF 3

MISCELLANEOUS





STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-5"	Does Not Exist	2'-0"
#8	4'-6"		2'-7"
#9	5'-7"		3'-3"
#10	7'-2"		4'-1"
#11	8'-10"		5'-1"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used. CASE NO.2 - For bars coated with epoxy not in Case No.1.

2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.

3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

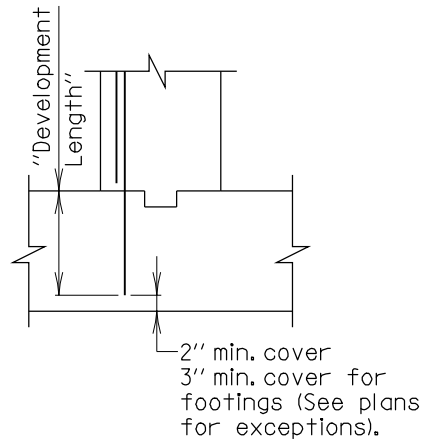
APPROVAL	
<i>L.S. Fisher</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE: .

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.14)-90-214

SHEET 3 OF 3



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-11"	2'-1"	1'-8"
#8	3'-9"	2'-9"	2'-2"
#9	4'-9"	3'-5"	2'-9"
#10	6'-1"	4'-4"	3'-6"
#11	7'-5"	5'-4"	4'-3"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.08)-86-178.

APPROVAL	
<i>E. S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	
1-22-01	
9-20-05	
11-26-07	

FHWA APPROVAL  
DATE:

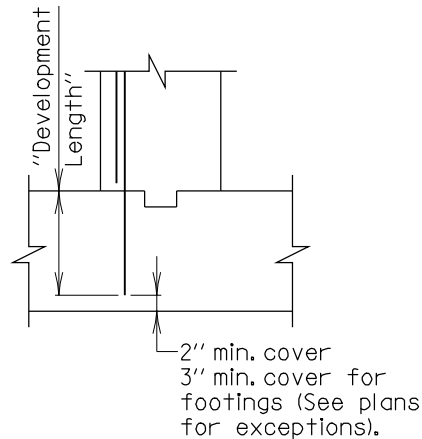
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.14)-90-214(L)

SHEET 1 OF 3



MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-6"	3'-1"	2'-6"	2 5/8"	5 1/4"	6 1/8"
#8	4'-7"	4'-1"	3'-3"	3"	6"	7"
#9	5'-9"	5'-1"	4'-1"	3 3/8"	6 3/4"	7 7/8"
#10	7'-4"	6'-6"	5'-2"	3 3/4"	7 5/8"	8 1/8"
#11	9'-0"	7'-11"	6'-4"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.

2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.

3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>E.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE:

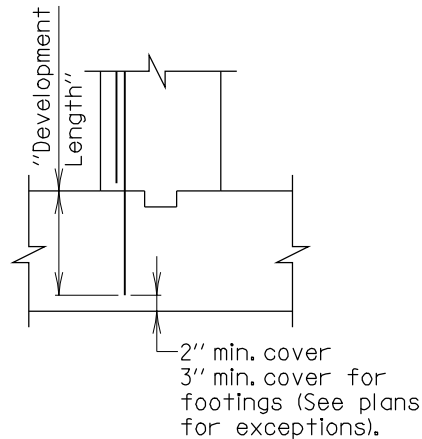
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.14)-90-214(L)

VERIFIED  
11-26-2007  
LRFD

SHEET 2 OF 3



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-5"	Does Not Exist	2'-0"
#8	4'-6"		2'-7"
#9	5'-7"		3'-3"
#10	7'-2"		4'-1"
#11	8'-10"		5'-1"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used. CASE NO.2 - For bars coated with epoxy not in Case No.1.

2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.

3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Fisher</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

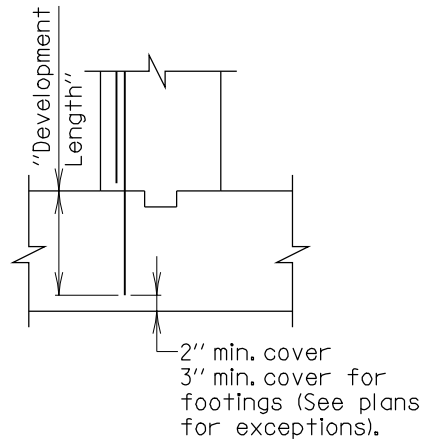
FHWA APPROVAL  
DATE: .

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.14)-90-214(L)

SHEET 3 OF 3





STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-11"	1'-4"	1'-1"
#5	2'-4"	1'-8"	1'-4"
#6	2'-10"	2'-0"	1'-8"
#7	3'-4"	2'-5"	1'-11"
#8	4'-5"	3'-2"	2'-7"
#9	5'-7"	4'-0"	3'-3"
#10	7'-1"	5'-1"	4'-1"
#11	8'-8"	6'-3"	5'-0"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.09)-86-179.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 2/2/90	
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1-22-01	
9-20-05	
12-4-07	

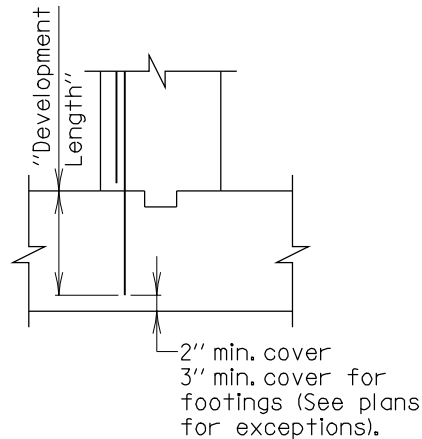
FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.15)-90-215

SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	2'-4"	2'-0"	1'-8"	1 1/2"	3"	3 1/2"
#5	2'-10"	2'-6"	2'-0"	1 7/8"	3 3/4"	4 3/8"
#6	3'-5"	3'-0"	2'-5"	2 1/4"	4 1/2"	5 1/4"
#7	4'-1"	3'-7"	2'-11"	2 5/8"	5 1/4"	6 5/8"
#8	5'-4"	4'-9"	3'-10"	3"	6"	7"
#9	6'-9"	6'-0"	4'-10"	3 3/8"	6 3/4"	7 7/8"
#10	8'-7"	7'-7"	6'-1"	3 3/4"	7 5/8"	8 5/8"
#11	10'-7"	9'-4"	7'-6"	4 1/4"	8 1/2"	9 5/8"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.

2. These development lengths only apply to 4500 P.S.I. lightweight concrete.

3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

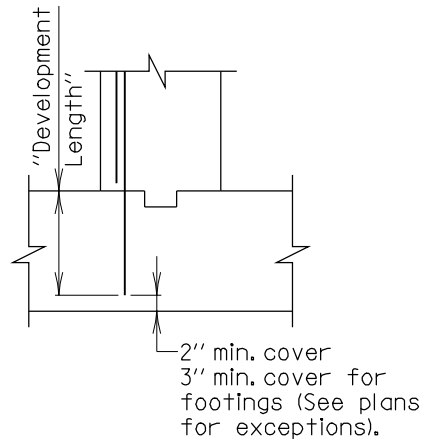
CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>E. S. Fisher</i>	DIRECTOR
OFFICE OF STRUCTURES	
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12-4-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. M(6.15)-90-215	SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-3"	1'-7"	1'-3"
#5	2'-9"	2'-0"	1'-7"
#6	3'-4"	2'-5"	1'-11"
#7	3'-11"	Does Not Exist	2'-3"
#8	5'-2"		2'-11"
#9	6'-6"		3'-9"
#10	8'-3"		4'-9"
#11	10'-1"		5'-9"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

CASE NO.2 - For bars coated with epoxy not in Case No.1.

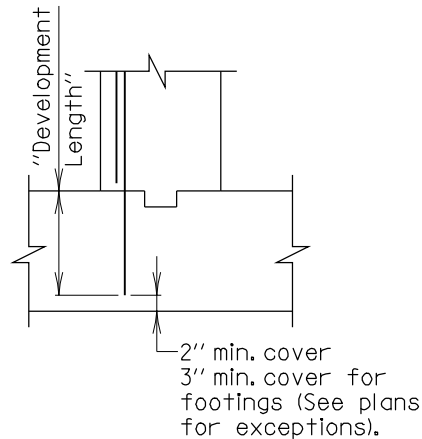
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

APPROVAL	
<i>L.S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
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FHWA APPROVAL  
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. M(6.15)-90-215	SHEET <u>3</u> OF <u>3</u>

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-11"	1'-4"	1'-1"
#5	2'-4"	1'-8"	1'-4"
#6	2'-10"	2'-0"	1'-8"
#7	3'-4"	2'-5"	1'-11"
#8	4'-5"	3'-2"	2'-7"
#9	5'-7"	4'-0"	3'-3"
#10	7'-1"	5'-1"	4'-1"
#11	8'-8"	6'-3"	5'-0"

\* LOCATION CATEGORY:


- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

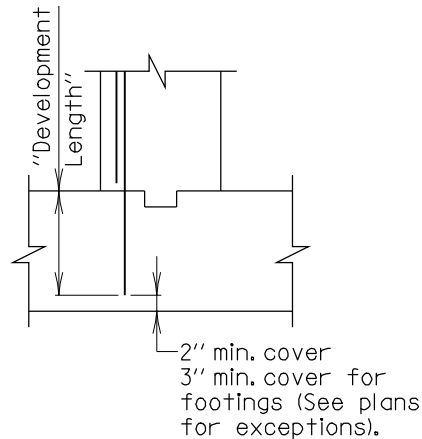
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.09)-86-179.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES		
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING		
STANDARD NO. M(6.15)-90-215(L)		SHEET <u>1</u> OF <u>3</u>





STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	2'-4"	2'-0"	1'-8"	1 1/2"	3"	3 1/2"
#5	2'-10"	2'-6"	2'-0"	1 7/8"	3 3/4"	4 3/8"
#6	3'-5"	3'-0"	2'-5"	2 1/4"	4 1/2"	5 1/4"
#7	4'-1"	3'-7"	2'-11"	2 5/8"	5 1/4"	6 1/8"
#8	5'-4"	4'-9"	3'-10"	3"	6"	7"
#9	6'-9"	6'-0"	4'-10"	3 3/8"	6 3/4"	7 7/8"
#10	8'-7"	7'-7"	6'-1"	3 3/4"	7 5/8"	8 1/8"
#11	10'-7"	9'-4"	7'-6"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.

2. These development lengths only apply to 4500 P.S.I. lightweight concrete.

3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>E. S. Fisher</i> DIRECTOR	OFFICE OF STRUCTURES
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REVISIONS	
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9-20-05	.
11-26-07	.

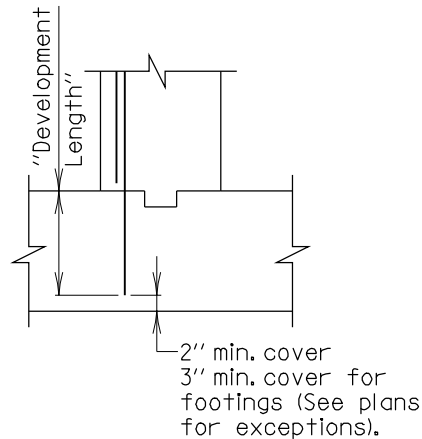
FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.1

STANDARD NO. M(6.15)-90-215(L)

SHEET 2 OF 3





STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-3"	1'-7"	1'-3"
#5	2'-9"	2'-0"	1'-7"
#6	3'-4"	2'-5"	1'-11"
#7	3'-11"	Does Not Exist	2'-3"
#8	5'-2"		2'-11"
#9	6'-6"		3'-9"
#10	8'-3"		4'-9"
#11	10'-1"		5'-9"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

CASE NO.2 - For bars coated with epoxy not in Case No.1.

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
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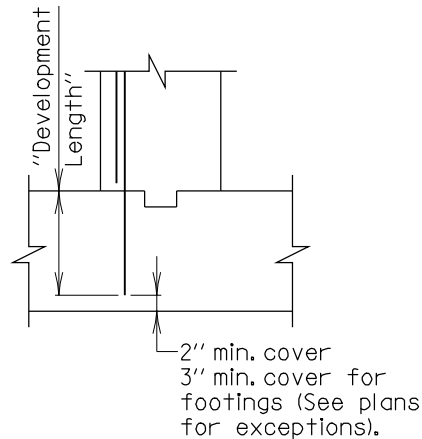
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STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.2



STANDARD NO. M(6.15)-90-215(L)

SHEET 3 OF 3



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-7"	1'-10"	1'-6"
#8	3'-4"	2'-5"	1'-11"
#9	4'-3"	3'-0"	2'-5"
#10	5'-4"	3'-10"	3'-1"
#11	6'-7"	4'-8"	3'-9"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_s = 24,000$  p.s.i."
- If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.10)-86-180.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 2/2/90	
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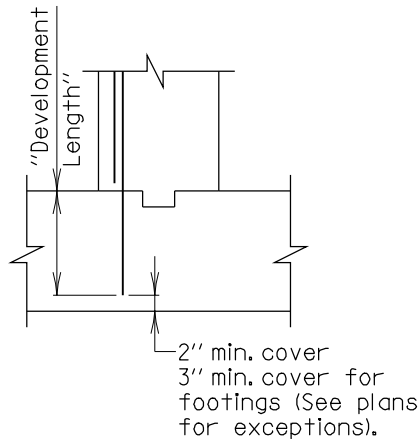
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STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.6 (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.16)-90-216

SHEET 1 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-1"	2'-9"	2'-2"	2 5/8"	5 1/4"	6 1/8"
#8	4'-1"	3'-7"	2'-10"	3"	6"	7"
#9	5'-1"	4'-6"	3'-7"	3 3/8"	6 3/4"	7 7/8"
#10	6'-6"	5'-9"	4'-7"	3 3/4"	7 5/8"	8 1/8"
#11	7'-11"	7'-0"	5'-7"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

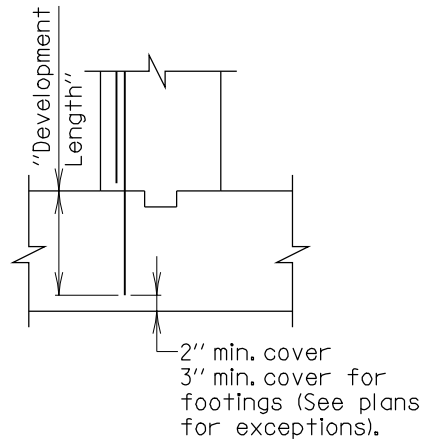
CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>E.S. Faden</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
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9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. M(6.16)-90-216	SHEET 2 OF 3

MISCELLANEOUS



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-0"	Does Not Exist	1'-9"
#8	3'-11"		2'-3"
#9	5'-0"		2'-10"
#10	6'-4"		3'-8"
#11	7'-9"		4'-5"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

CASE NO.2 - For bars coated with epoxy not in Case No.1.

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design, fs= 24,000 p.s.i."

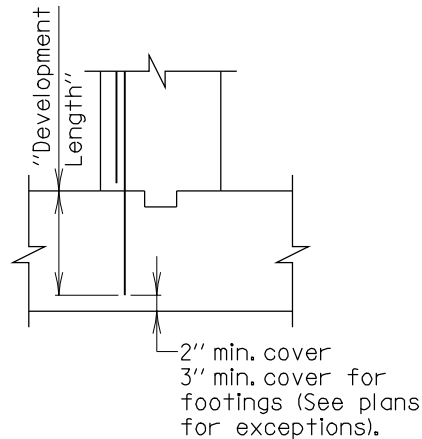
APPROVAL	
<i>L.S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
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9-20-05	.
12-4-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.6 (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. M(6.16)-90-216

SHEET 3 OF 3



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-7"	1'-10"	1'-6"
#8	3'-4"	2'-5"	1'-11"
#9	4'-3"	3'-0"	2'-5"
#10	5'-4"	3'-10"	3'-1"
#11	6'-7"	4'-8"	3'-9"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."
- If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. M(6.10)-86-180.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	
OFFICE OF STRUCTURES	
DATE: 2/2/90	
REVISIONS	
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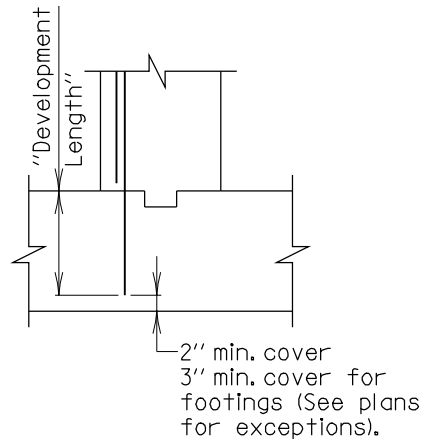
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STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.6 (4500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING

STANDARD NO. M(6.16)-90-216(L)

SHEET 1 OF 3





STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-1"	2'-9"	2'-2"	2 5/8"	5 1/4"	6 1/8"
#8	4'-1"	3'-7"	2'-10"	3"	6"	7"
#9	5'-1"	4'-6"	3'-7"	3 3/8"	6 3/4"	7 7/8"
#10	6'-6"	5'-9"	4'-7"	3 3/4"	7 5/8"	8 1/8"
#11	7'-11"	7'-0"	5'-7"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.

B- All bars not in Category A spaced less than 6" apart.

C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.

2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.

3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>E. S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

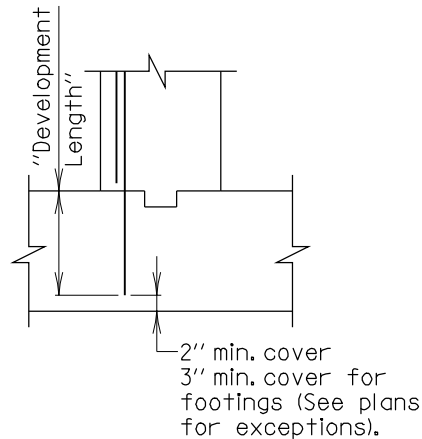
FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.6 (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.1



STANDARD NO. M(6.16)-90-216(L)

SHEET 2 OF 3



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-0"	Does Not Exist	1'-9"
#8	3'-11"		2'-3"
#9	5'-0"		2'-10"
#10	6'-4"		3'-8"
#11	7'-9"		4'-5"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

CASE NO.2 - For bars coated with epoxy not in Case No.1.

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate "Reinforcing Steel Design,  $f_y = 60$  ksi."

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR	OFFICE OF STRUCTURES
DATE: 2/2/90	
REVISIONS	
SHA	FHWA
11-23-93	.
1-22-01	.
9-20-05	.
11-26-07	.

FHWA APPROVAL  
DATE:

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
DEVELOPMENT LENGTH DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.6 (4500 P.S.I.) CONCRETE  
EPOXY COATED REINFORCING CASE NO.2

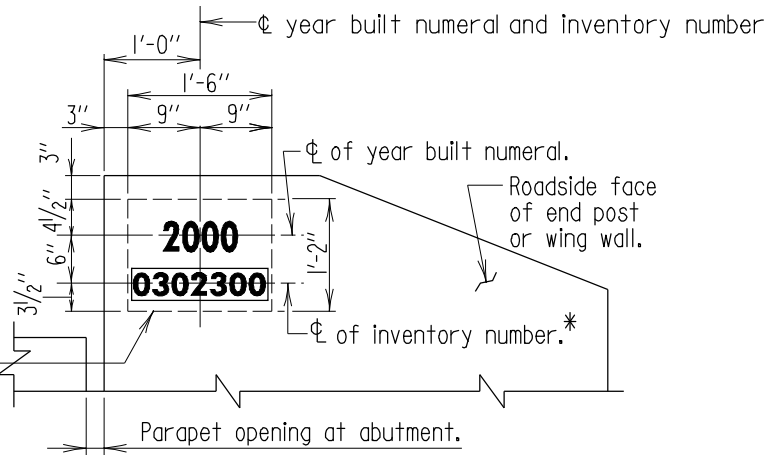


STANDARD NO. M(6.16)-90-216(L)

SHEET 3 OF 3

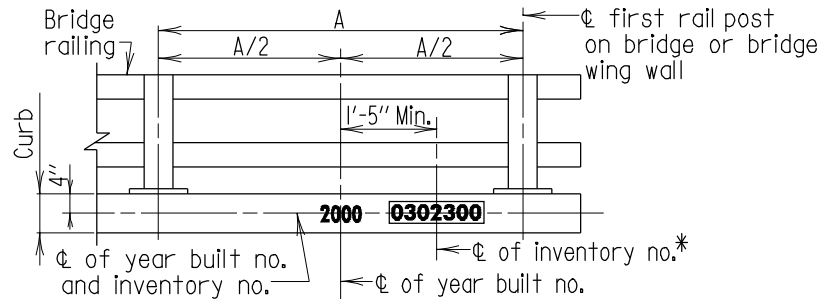


If end post has a form liner finish, place year built and structure inventory numbers in curb area as shown for bridges with railing and no parapets.  $\phi$  of year built to be located 1'-0" from parapet opening at abutment.

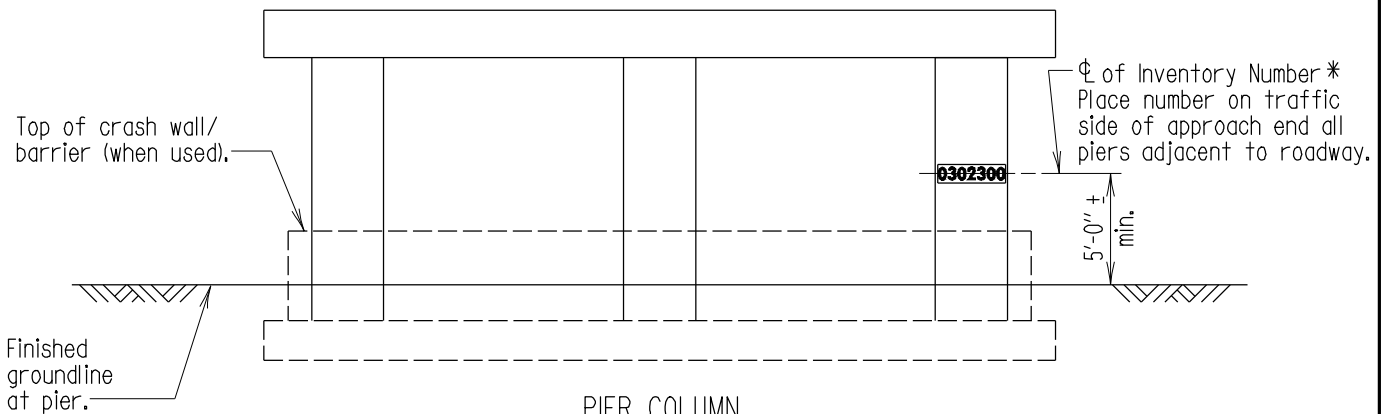


#### BRIDGES WITH PARAPET

Location: Dual Bridges-Each Approach End (Outside Shoulder).  
Single Bridge - Approach End - North or East corner.  
Where bridge has a concrete parapet and no definitive end post, place year built marking and structure inventory number on face of parapet as close to center line of bearing at abutment as practical.



#### BRIDGES WITH RAILING AND NO PARAPETS



#### PIER COLUMN

ONLY ON ROAD OVER ROAD BRIDGES

\* Black numbers 3" high on a painted white background, (5" x 17").

#### Notes:

- For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1942-2000 (old year first - new year).
- For existing structures with no year built contact the Office of Structures for old year.
- For Year Built Numerals refer to Standard No. M(0.07)-99-334.

FHWA APPROVAL  
DATE:

APPROVAL	
<i>L. S. Fisher</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 9/14/99	
REVISIONS	
SHA	FHWA
3-10-00	.
12-7-00	.
1-22-01	.

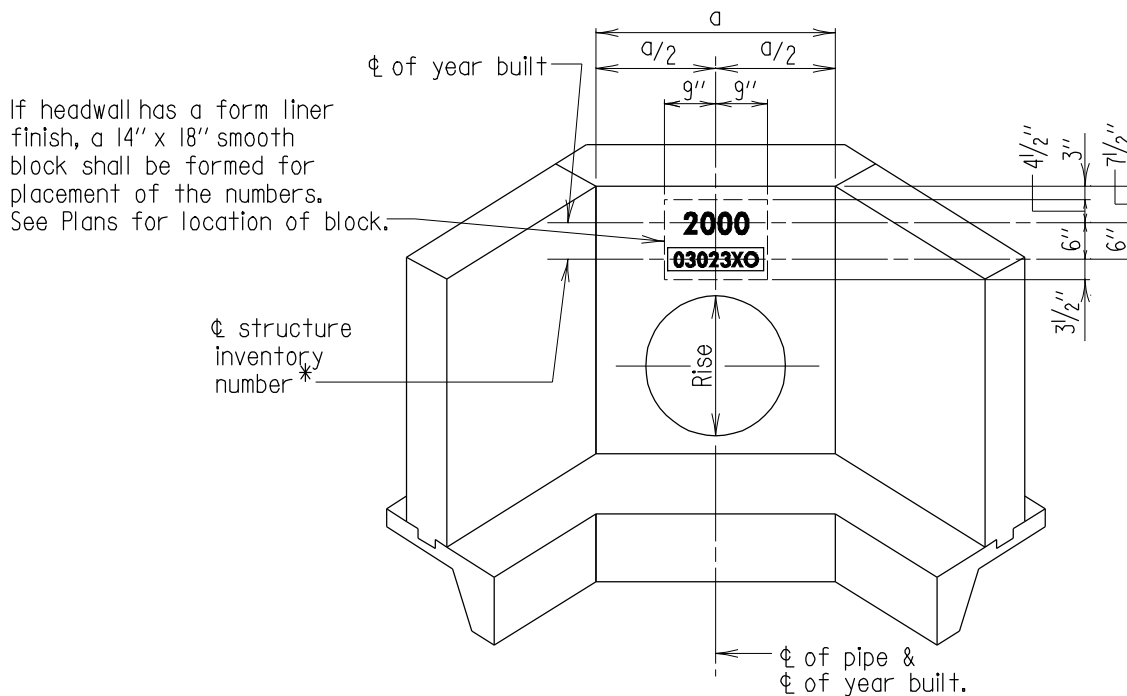
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

LOCATION OF YEAR BUILT MARKING AND  
STRUCTURE INVENTORY NUMBER ON BRIDGES

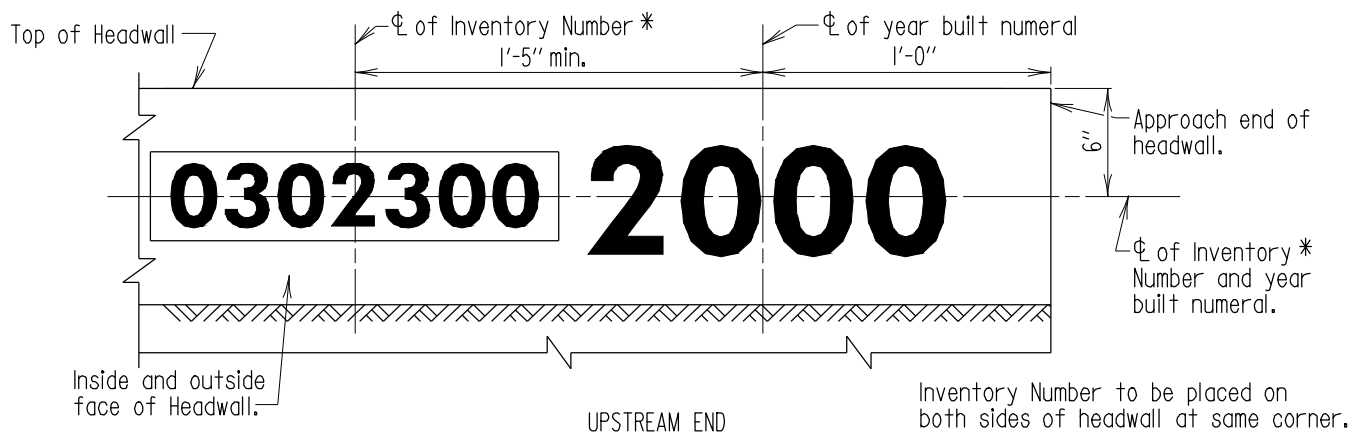
STANDARD NO. M(0.04)-99-331

SHEET 1 OF 1

MISCELLANEOUS



# HEADWALLS FOR PIPES AND/OR PIPE ARCHES WITH RISE 3'-0" OR GREATER



## BOX CULVERTS

\* Black numbers 3" high on a painted white background, (5" x 17").

### Notes:

- For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1942-2000 (old year first - new year).
- For existing structures with no year built contact Office of Structures for old year.
- For Year Built Numerals refer to Standard No. M(0.07)-99-334.

APPROVAL	
<i>L. S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
DATE: 9/14/99	
REVISIONS	
SHA	FHWA
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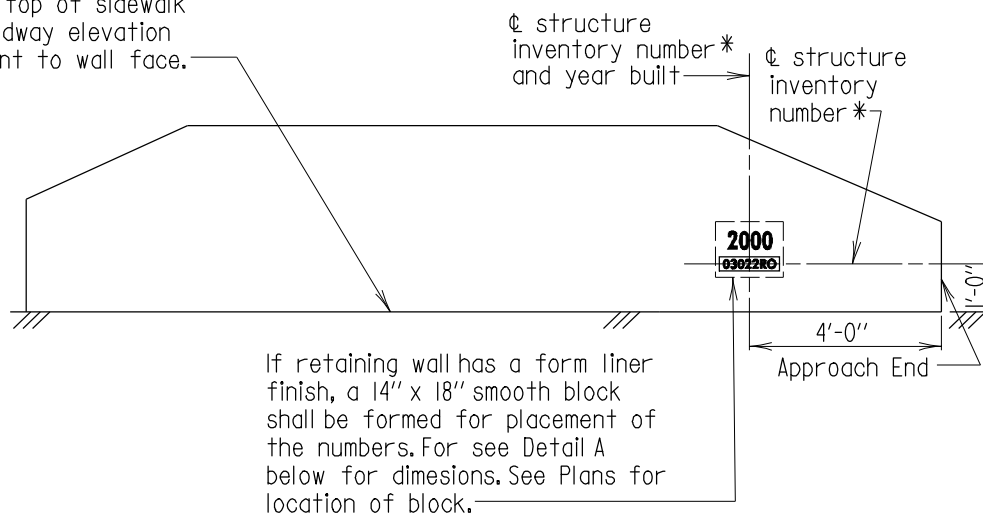
FHWA APPROVAL  
DATE: .

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
LOCATION OF YEAR BUILT MARKING AND  
STRUCTURE INVENTORY NUMBER ON  
HEADWALLS FOR PIPES AND BOX CULVERTS

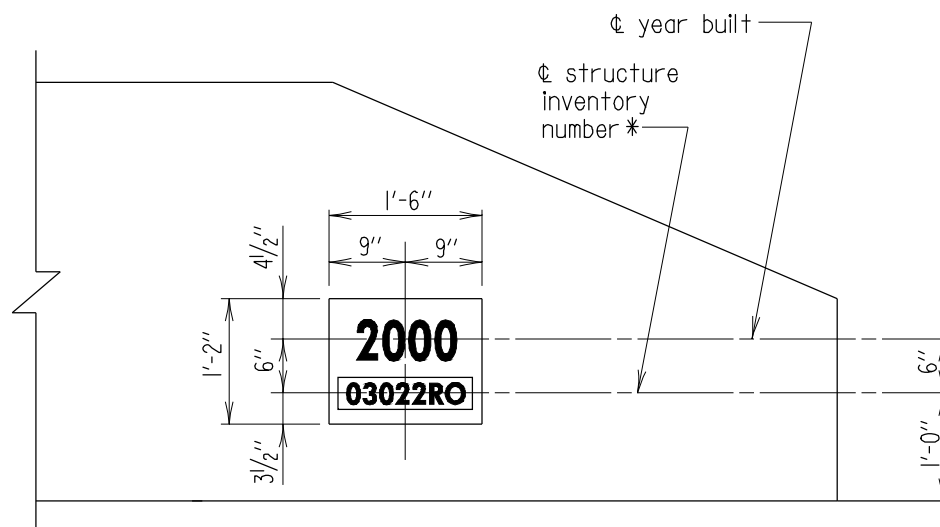
STANDARD NO. M(0.05)-99-332

SHEET 1 OF 1

Finished groundline, top of sidewalk  
and/or finished roadway elevation  
whichever is adjacent to wall face.



## RETAINING WALLS



## DETAIL A

### Notes:

- For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1942-2000 (old year first - new year).
- For existing structures with no year built contact the Office of Structures for old year.
- For Year Built Numerals refer to Standard No. M(0.07)-99-334.
- For retaining walls that are not visible from the approach roadway, refer to BR-MAINT(0.02)-00-339.

\* Black numbers 3" high on a painted white background, (5" x 17").

APPROVAL	
<i>L. S. Friedman</i>	DIRECTOR
OFFICE OF STRUCTURES	
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REVISIONS	
SHA	FHWA
3-10-00	.
1-22-01	.
9-20-05	.

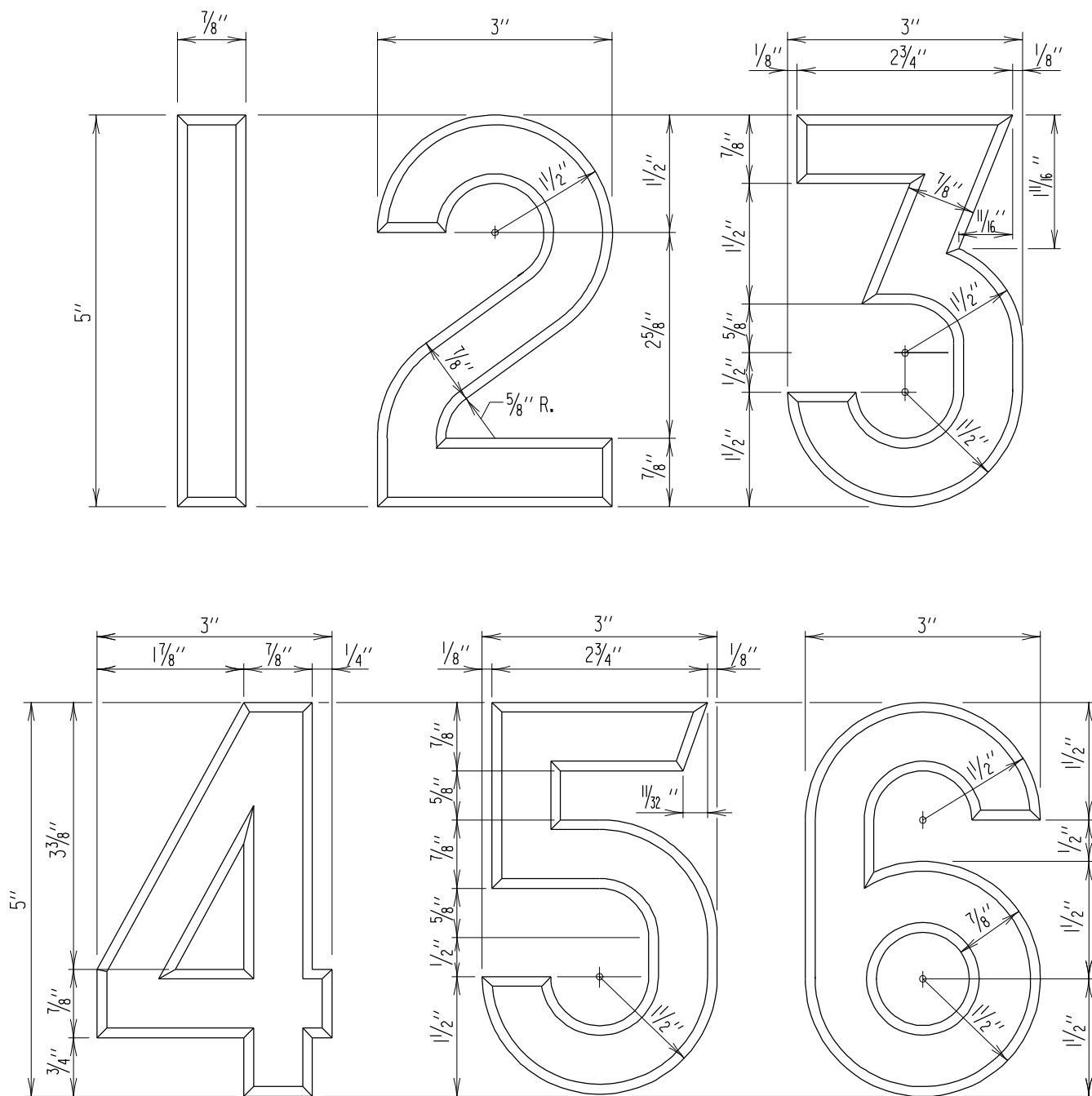
FHWA APPROVAL  
DATE: .

STATE OF MARYLAND  
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STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

LOCATION OF YEAR BUILT MARKING AND  
STRUCTURE INVENTORY NUMBER ON RETAINING WALLS

STANDARD NO. M(0.06)-99-333

SHEET 1 OF 1



**Note:**

Year built numerals to be indented into concrete (unpainted) - as indicated on Standard Nos. M(0.04)-99-331, M(0.05)-99-332 and M(0.06)-99-333.

APPROVAL	
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REVISIONS	
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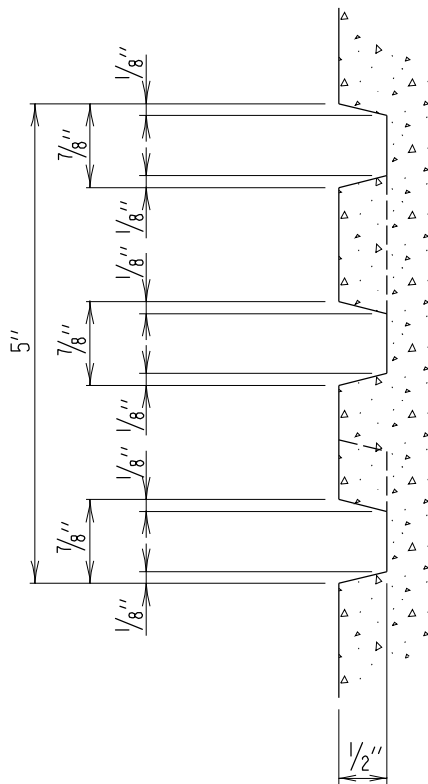
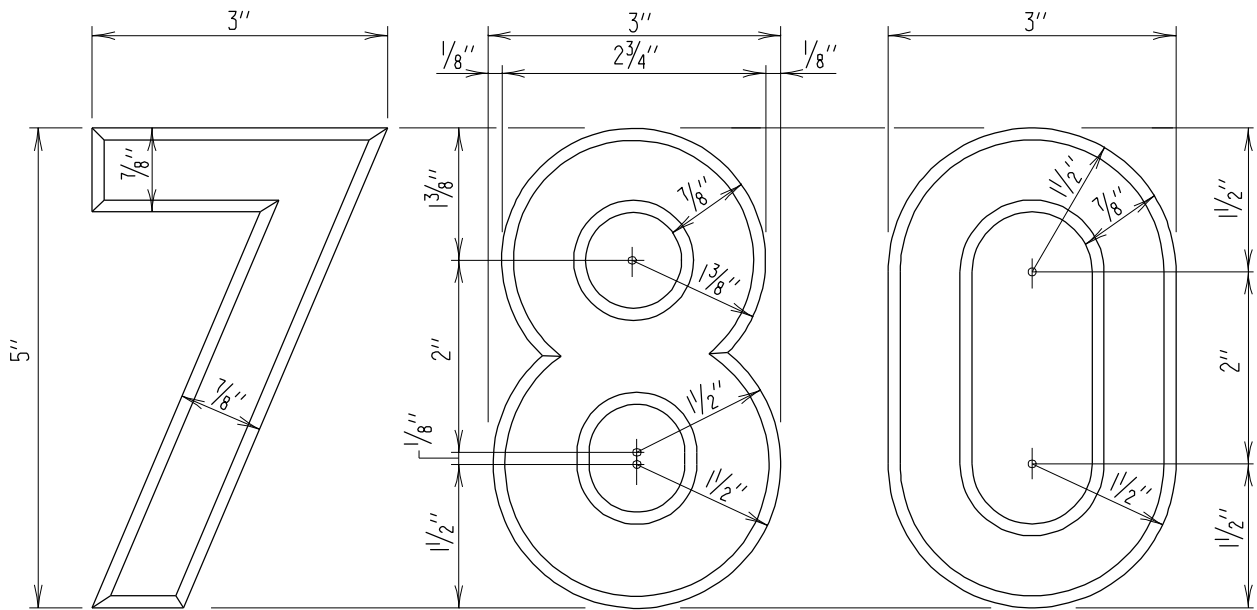
STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

NUMERALS FOR YEAR BUILT MARKING  
ON STRUCTURES

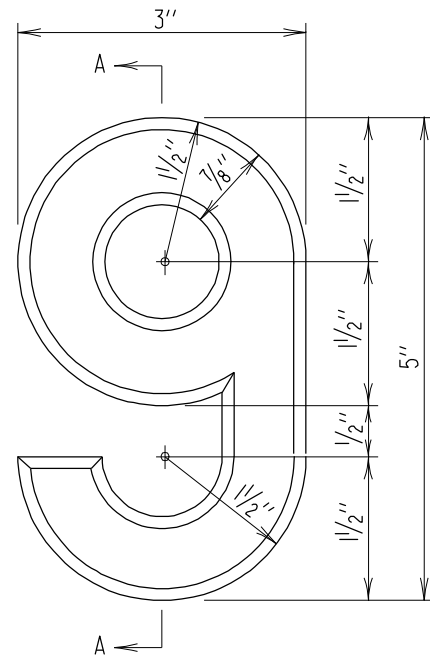
STANDARD NO. M(0.07)-99-334

SHEET 1 OF 2

MISCELLANEOUS



SECTION A-A



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<i>E.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 9/14/99	
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FHWA APPROVAL	.
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STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
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NUMERALS FOR YEAR BUILT MARKING  
ON STRUCTURES

STANDARD NO. M(0.07)-99-334

SHEET 2 OF 2